Community-based Suburban Deer Management: Six Case Studies of Issue Evolution, Capacity, and Intervention

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EXECUTIVE SUMMARY

This study investigated community-based collaborative deer management in suburban areas in New York and Massachusetts as a cooperative effort with the USGS, University of Massachusetts at Amherst, the New York State Department of Environmental Conservation (NYSDEC), and the Massachusetts Division of Fisheries and Wildlife (DFW). Results of this inquiry can aid wildlife managers in designing intervention processes that are in synchrony with the evolution of deer issues and are conducive to fostering effective collaborative processes and outcomes.

Community-based, collaborative efforts to manage white-tailed deer (*Odocoileus virginianus*) in suburban areas have increased over the last two decades. Insofar as collaborative approaches are being employed for managing deer, learning the details of the situations in which these approaches are implemented and how they might be improved is of interest to deer managers across the northeastern United States.

We identified three cases of collaborative, community-based deer management in New York (Cayuga Heights, Amherst, and Clarence) and three in Massachusetts (Wilbraham, Walpole, and Ipswich) for this study. Using a variety of qualitative methods applied to our six case investigations, we answered the questions:

1) How do deer management issues evolve in communities?

2) What criteria do stakeholders use to measure the success of collaborative deer management?

3) What factors influence the success of collaborative management?

The results suggested that the community-based deer issues we studied roughly follow the eight-stage model of public issue evolution set forth by Hahn (1988): concern, involvement, issue, alternatives, consequences, choice, implementation, and evaluation. However, each of the six cases evolved at different rates, and in some cases the issue stagnated and then reverted back to an earlier stage.

We identified five classes of criteria that participants in the study used to assess the success of collaborative deer management: process, environmental outcome, socioeconomic outcome, impact outcome, and management action.

In addition, study participants identified factors related to capacity, intervention, and the context that have significant influence on the success of collaborative deer management. Capacity factors of importance are: partnerships, credibility, funding, relationships, common purpose, knowledge, and leadership. Critical intervention factors are: stakeholder involvement, education, communication, assessment, wildlife agency flexibility, and planning. Context factors influencing success are: time, power, emotion, and government structure.

Analysis of the important factors described above with respect to the issue evolution model revealed that specific factors were most important at specific stages of issue evolution in

our cases. Integrating these concepts provides a foundation from which to design an intervention strategy that acts in concert with deer-issue evolution. We believe this approach to intervention design has potential to improve effectiveness and efficiency.

The results of this research point to considerations for wildlife professionals and other interventionists interested in enhancing the quality of collaborative decision-making processes. Based on these findings, while recognizing more work is needed to verify and perhaps even expand the sets of factors we identified, we offer the following preliminary considerations for designing intervention strategies:

- Identify the communities' historic and current physical environment as related to deer ecology and management.
- Determine who the affected individuals and groups are and what skills and assets each brings to the collaborative decision-making process.
- Determine how far the deer issue has evolved.
- Identify criteria that will be used to assess the success of the decision-making process and the deer management program from the stakeholders' perspective.
- Determine the nature of the social environment in which decision-making will take place (e.g. major players, issues of power, government structure, etc.).
- Determine which dimensions of capacity are most needed at the current stage of deer-issue evolution.
- Design intervention strategies that deliberately attempt to build the most relevant dimensions of capacity.

With these considerations in mind, we believe that collaborative decision making for community-based, suburban deer management can be facilitated. However, further research is needed to evaluate this. An intervention strategy based on the findings of this study and then evaluated for its efficiency and effectiveness would likely lead to refinements in these guidelines. Other cases must also be explored to determine if additional dimensions of capacity and elements of intervention exist that are important for successful collaboration.

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INTRODUCTION

Over the last twenty years, negative human-wildlife interactions in suburban residential areas have increased (e.g., Decker et al. 2000; McNay 2002; Peterson et al. 2002; Teel, Krannich, and Schmidt 2002), perhaps most markedly with white-tailed deer (*Odocoileus virginianus*). Consequently, wildlife agencies, community leaders, local government officials, and others are confronting new challenges as all parties strive to find acceptable ways to reduce problems and cultivate positive impacts of deer for individuals and communities. Community involvement in deer management has increased in suburban areas as one response to these challenges.

Community involvement in wildlife management takes several forms today, and is spread across a continuum of approaches to decision making, ranging from total agency control to broad responsibility sharing among stakeholders (Decker and Chase 1997). One approach to deer management in the local context is community-based, collaborative management. This represents an effort on the part of state wildlife agencies, local governments, interest groups, citizens experiencing impacts from wildlife, and other stakeholders to work collaboratively to make decisions about deer management and implement management actions (Chase, Schusler, and Decker 2000; Schusler 1999). The variety of interests with respect to human-deer interactions creates a demand for management strategies that are tailored to specific communities, and require community participation and investment, typical elements of collaborative management (Chase, Schusler, and Decker 2000; Decker et al. 2000). Whereas traditional deer management is generally the result of broad, legislatively-driven policies that are achieved through regulation and enforcement, locally focused, collaborative, community-based management calls for cooperation and voluntary action.

Collaborative management has met with varying degrees of success. Previous research has categorized criteria for evaluating successful collaboration in natural resources management into three types: process, environmental outcomes, and socioeconomic outcomes (Conley and Moote 2003). Process criteria refer to qualities of the decision-making process itself, such as diverse, inclusive participation and consensus-based decision-making. Environmental outcome criteria include improved habitat and healthy wildlife. Socioeconomic outcome criteria include improved relationships and increased trust (Conley and Moote 2003; Lauber and Knuth 2000).

An assumption in collaborative management is that stakeholders have the capacity to engage effectively and efficiently in the decision-making process (Lauber and Knuth 2000). This assumption is not always valid at the outset, but collaborative processes can be designed to build the capacity of agencies, communities, and individuals to participate effectively in community-based, collaborative decision making (Wondolleck and Yaffee 2000). By understanding the capacity needs of stakeholders and others involved in collaborative decision making, interventionists such as wildlife managers, local government officials, or other individuals who are responsible for designing such processes can therefore focus their efforts and achieve maximum benefits. In addition, educational programs can be designed in synchrony with the evolution of public issues (Hahn 1988). This has implications for collaborative deer management when interventionists (e.g., wildlife professionals, extension educators, community leaders) engage in education and other activities as deer issues evolve. Thus, inquiry into the

role of capacity in the evolution of deer management issues is of interest for improving community-based, collaborative management.

Issue Evolution, Capacity, and Intervention – A Theoretical Synthesis

Several scholars have described the evolution of public issues (e.g., Dale and Hahn 1994; House and Young 1988; Reedy and Wallace 1992) with the goal of planning issue-education programs congruent with public information or process needs at various stages of this evolution. For this study, we adapt the linear model of "stages of public issue evolution" described by Hahn (1988) to suburban deer issues (Figure 1). This model has eight stages:

1. **Concern** – During the concern stage, individuals or groups of stakeholders identify undesirable impacts of deer in their community.

2. **Involvement** – In the involvement stage, some people with concerns about deer seek support from one another and inform officials of their concerns.

3. **Issue** – In the issue stage, general agreement will form among a critical mass of community residents about the nature of deer-related impacts in the community.

4. **Alternatives –** At this stage in the evolution of community-based deer management issues, people begin considering management actions.

5. **Consequences –** In the consequences stage, all proposed alternative actions are evaluated for their ability to address the impacts of concern in terms of effectiveness and cost.

6. **Choice –** In this stage, stakeholders and decision makers deliberate about which alternatives to adopt for their community.

7. **Implementation –** In the implementation stage, actions prescribed for a management program are taken.

8. **Evaluation –** At this stage, the impacts of management actions are assessed. Outcomes of evaluation may bring the issue back to the concern stage if anyone becomes concerned that the program should be improved, modified, or discontinued.

Public issues do not necessarily emerge and grow exactly as described by this model of issue evolution. Nevertheless, as we report below, the model provides a useful framework for understanding the development of deer issues and the kinds of educational intervention strategies that might guide stakeholders in collaborative decision-making.

Hahn (1988) theorizes that issue education can be deliberately geared toward achieving specific objectives at each stage of evolution. Issue educators provide people with the tools they need to understand and participate in decision making (Hahn 1988).

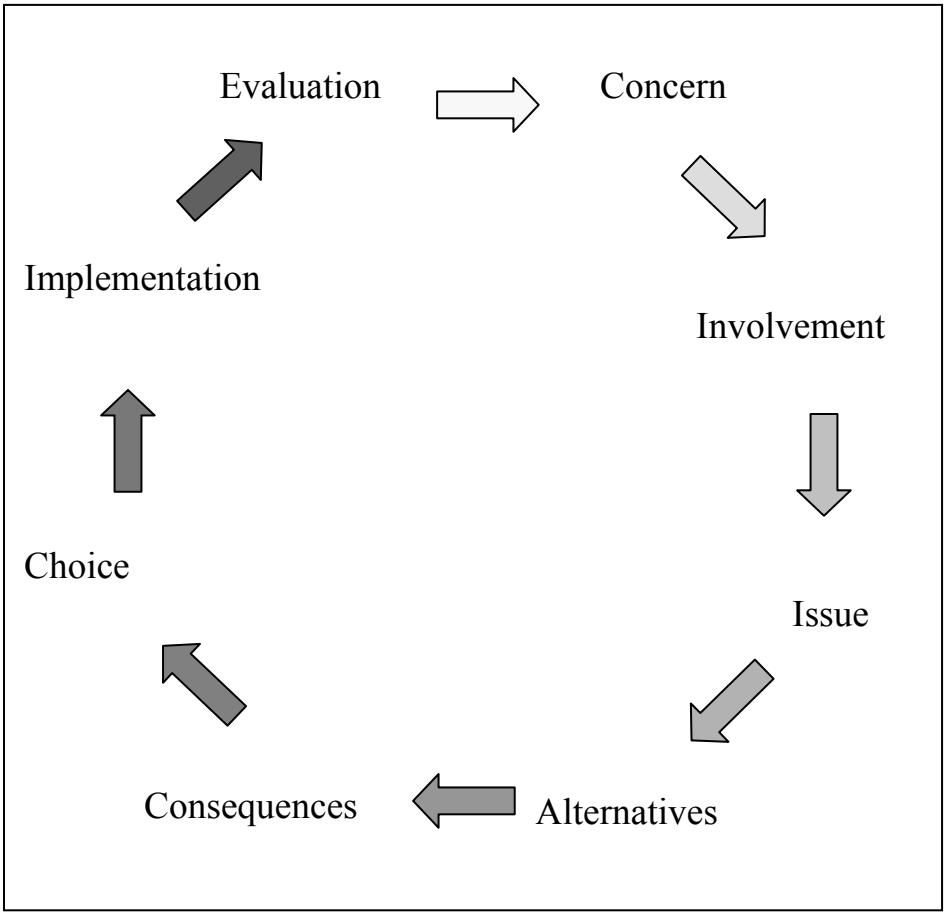

Figure 1. Issue-evolution model (adapted from Hahn 1988).

Issue education is one intervention tool that can be used for building capacity (Payne 1995). With respect to community-based deer management, this translates into building the capacity of individuals, communities, and various institutions to facilitate reaching an acceptable solution to a deer issue. Interventionists are individuals or entities who deliberately motivate change and intentionally attempt to catalyze development of local capacity (Rogers 1990). The interventionist in public issue education often plays many roles, and works in collaboration with many individuals. In addition to collecting and disseminating information, issue educators also often facilitate decision-making processes and manage conflicts to equalize individual stakeholders' ability to participate effectively (Hahn 1988).

Effective interventionists tailor their activities to immediate capacity needs (Payne 1995). The concept of capacity can be traced to both theoretical and applied research (Mengers 2000) in the fields of sociology, community psychology, community development, social work, natural resource management, international development, and personnel management. The term capacity has appeared in the wildlife management literature in reference to three main concepts: (1) biological carrying capacity (e.g., Miller and Wentworth 2000), (2) cultural carrying capacity (e.g., Ellingwood and Spignesi 1986; Minnis and Peyton 1995; West and Parkhurst 2002), and (3) wildlife acceptance capacity (Decker and Purdy 1988; Carpenter, Decker, and Lipscomb

2000; Riley et al. 2002). However, a definition of capacity focused on stakeholders' or communities' ability to participate in wildlife policy and management decision making and implementation is lacking. A synthesis of general literature about community capacity with literature about community-based wildlife management provides a conceptual foundation for inquiry about collaborative decision making in such settings.

Capacity in social science can be categorized into three main groups:

1. **Institutional** (referring to an organization or set of organizations; e.g., state or federal wildlife management agency, local government, conservation non-governmental organization [NGO])

2. **Community** (referring to informal groups bounded geographically; e.g., town, neighborhood)

3. **Individual** (referring to individual people; i.e., citizens)

Institutional capacity may include resources such as personnel (Mengers 2000), funding (Lewis 1998), and materials (Ta'I 2000), or organizational elements such as partnerships (Wondolleck and Yaffee 2000) and programming (Troja 2000). Community capacity may include relationships (Landre and Knuth 1993), a sense of common purpose (Schusler, Decker, and Pfeffer 2003), and a sense of shared values and history (Goodman et al. 1998). Individual capacity may include leadership skills (Goodman et al. 1998), analytical skills (Poole 1997), and technical knowledge (Wondelleck and Yaffee 2000).

Increased capacity can contribute to empowerment of individuals and groups, which has been shown to lead to sustained and meaningful action (Rappaport 1981). Empowerment – here referring to democratic participation in one's community or exerting ownership and influence over important events and outcomes in one's own life (Rappaport 1987) – is critical to motivating sustained action related to conservation (Wondelleck and Yaffee 2000). Capacity can develop as the result of spontaneous, organic processes, or it can be spurred by deliberate intervention (Rogers 1990). Interventions that enable development of capacity may contribute to effective and efficient collaborative decision making in communities (Figure 2).

In addition to contributing to the development of capacity, interventionists act in concert with the evolution of an issue, and focus their efforts at each stage of evolution for greatest effect (Hahn 1988). Therefore, integrating the model of issue evolution/public issue education with capacity theory provides a robust conceptual framework in which to conduct inquiry about intervention for collaborative decision making in deer management.

This inquiry relies upon the issue evolution model, public issue education, and capacity theory to uncover key factors contributing to effective, collaborative decision-making in community-based suburban deer management.

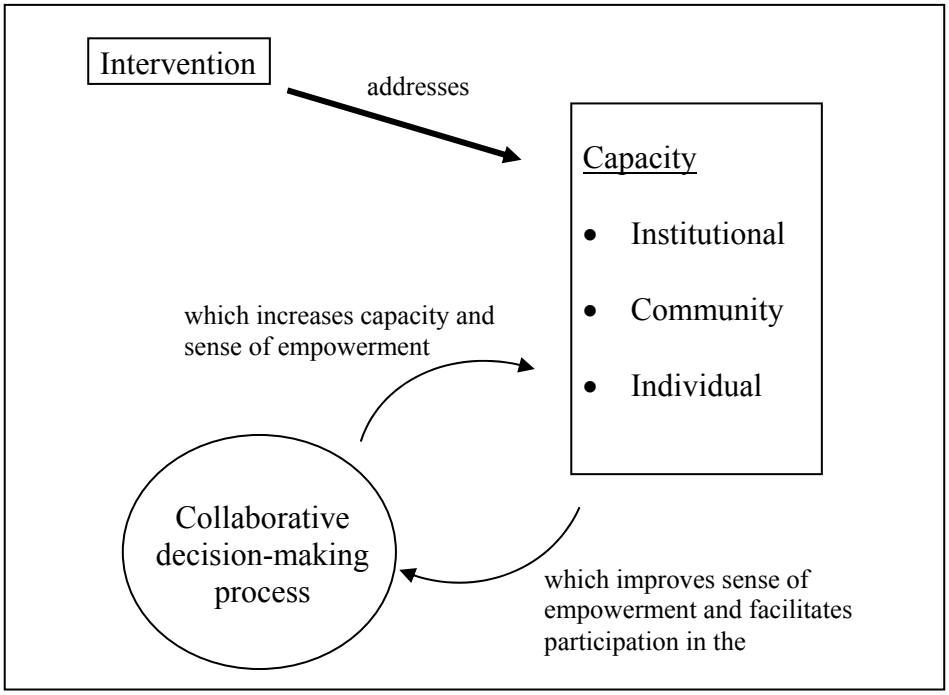

Figure 2. Relationships among interventions, capacity development, and collaborative decision making.

Study Purpose

The purpose of this study was to understand community-based, collaborative white-tailed deer management in suburban communities from the stakeholders' perspective. Specifically, we analyze (a) stakeholders' involvement in collaborative decision-making about deer management issues at a community level and (a) intervention strategies used to develop capacity and inform the decision-making process. This inquiry is guided by the questions: (1) *how do community-based deer management issues evolve?* (2) *what criteria do stakeholders use to measure the success of community-based, collaborative decision-making about deer management issues?* and (3) *what factors contribute to and inhibit the success of community-based, collaborative decision-making about deer management issues?* Understanding what types of capacity are important for collaborative deer management in suburban areas may help wildlife agencies and stakeholders work together. In addition, knowledge about what dimensions of capacity are most important as a deer issue evolves and how intervention strategies might be designed to maximize the benefits of increased capacity may lead to improvement of collaborative decision-making.

This report addresses the following research objective and presents related research products.

Study objective:

To identify key elements of intervention strategies that lead to acceptable and efficient deer management in communities.

Expected research products:

1. Articulation of wildlife managers' models for six cases of community-based deer management approaches.

2. Stakeholder assessment of these six models focusing on intervention strategies.

3. Guidelines (preliminary) for designing an intervention (this includes both the strategy for and content of the intervention) and the roles of the wildlife manager in community-based deer management.

METHODS

We identified six cases of suburban deer management in New York and Massachusetts to investigate the role of capacity in collaborative, community-based decision-making for deer management. We selected three cases in New York (Cayuga Heights, Amherst, and Clarence) and three in Massachusetts (Wilbraham, Walpole, and Ipswich). The cases were chosen using criterion-based selection (LeCompte and Preissle 1993). Table 1 describes the criteria used to select the six cases.

We identified stakeholders involved in the deer issue for each of the six cases. We used semi-structured, in-depth interviews (LeCompte and Preissle 1993) to gather information from stakeholders about their involvement in the collaborative decision-making process. A total of 55 stakeholders were interviewed (Cayuga Heights $n = 10$, Amherst $n = 13$, Clarence $n = 7$, Wilbraham $n = 6$, Walpole $n = 8$, and Ipswich $n = 11$). Table 2 describes criteria used to identifying stakeholders.

We used the personal interviews to collect information about stakeholders' experiences in collaborative decision-making with respect to each deer management issue. The duration of personal interviews varied from 45-90 minutes. All interviews were conducted between December 2002 and April 2003 (i.e., Cayuga Heights: December 12, 2002 - January 30, 2003; Amherst: February 13 - March 13, 2003; Clarence: March 13 - April 9, 2003; Wilbraham: June 3 - 4, 2003; Walpole: June 9 - 10, 2003; Ipswich: June 12 - 30, 2003. We tape-recorded all interviews with the interviewees' permission. The methods and instrument used in this research were granted approval by Cornell University and University of Massachusetts at Amherst Human Subject Committees for the duration of research on the project. Content of the recordings, along with notes taken during the interview, provided data used in analysis.

Table 1. Criteria used to identify the six cases of community-based suburban deer management used in this study.

Criteria	Specific considerations	Rationale
Decision-making process timeframe	♦ The decision-making process took place within the last 5 years, or ♦ The case is still active and individuals involved in the case are still in the area	♦ Recollection of events is still fresh and accurate ♦ Individuals to interview are easily accessible
Evolution of deer management issue	♦ Cases reflect maturity in that they have evolved through several stages of issue evolution	♦ Individuals can reflect on interventions that occurred ♦ Mature cases will allow for analysis at each stage of issue evolution
Model of intervention	♦ Cases reflect some breath in terms of intervention approach	♦ Variety will allow for a greater breath of intervention activities to be analyzed

Table 2. Criteria used to identify stakeholders to be interviewed from each of the six communities.

Criteria	Specific considerations	Rationale
Official decision-making authority	♦ Elected or appointed officials who had decision-making power with regard to deer issues	♦ Decision-makers have a unique perspective that is important to understanding an issue's evolution
Lay leadership	♦ Well-respected members of the community who acted as opinion leaders but who do were not elected leaders	♦ Lay leaders often define discourse and contribute to the evolution of an issue
Expert knowledge or opinion	♦ Community residents, agency staff, or others who contributed to deliberation by providing information or recommendations	♦ Expert knowledge often defines the direction of discourse and contributes to the evolution of an issue
Grassroots effort	♦ Individuals who participated in debate as grassroots organizers.	♦ Grassroots organizers contribute to awareness-building campaigns or other communication efforts regarding an issue
Communication	♦ Individuals who affected deliberation by presenting and disseminating information	♦ Those who communicate information have access to knowledge and contribute to defining debate

Prior to the in-person interviews with stakeholders from the six communities, experienced deer managers from across the northeastern U.S. served as key informants about components of capacity that they perceive as being important for effective, collaborative decision making (see Raik, Decker, and Siemer 2003). We used information from these preliminary interviews to structure the in-depth stakeholder interviews (Hatch 2002; Seidman 1998) and to create the stakeholder interview schedule (Appendix A).

To ensure accuracy and validity of data gathered via interviews and document review, we conducted two forms of member checks (Douglas 1976). Cayuga Heights and Amherst were selected for the shared history (Emery and Purser 1996) method of member check based on the following criteria: (1) the deer management issue had gone through several stages of issue evolution, (2) key stakeholders involved in decision-making were available and amenable to reflect upon their experience in a group setting, and (3) a new burst of controversy was unlikely to develop as a result of the shared history activity itself. We held the Cayuga Heights shared history session in Ithaca, New York, on December 3, 2002. We held the Amherst shared history session in Amherst, New York, on March 20, 2003.

Typically the shared history approach is used as one portion of a search conference, a method for participatory planning with a large group (Emery and Purser 1996). To create a shared history, participants draw pictures and make brief notes along a chronological timeline emphasizing major events and forces that have influenced their community (e.g., Figure 3). Process managers then facilitate participant discussion of each item in the chronology. The process: recognizes that everyone in the room has relevant knowledge to contribute; highlights the interplay of both internal and external forces (ecological, economic, social, and political) shaping the community; and fosters learning by sharing diverse perspectives on the same events (Schusler, Decker, and Pfeffer 2003).

In this study, we used the shared history technique independently (i.e., a search conference was not held). Similar participatory techniques (e.g., community mapping, seasonal calendars, etc.) have evolved since the 1980's in international development work, and have been used to counter the extractive nature of conventional research (Pretty et al. 1995; Chambers 1997; Greenwood and Levin 1998). Rather than seeing research subjects as mere sources of information, participatory methods strive to benefit subjects by engaging them in reflection, and by viewing people as participants in research rather than passive subjects of research.

Creating a shared history among stakeholders in deer management produced a synergy not possible through data collection techniques with individual stakeholders. The shared history also provided an opportunity for public deliberation (Reich 1985; Yankelovich 1991; Matthews 1999) and collective reflection in which stakeholders engaged one another, sharing diverse perspectives and experiences to develop a common framework of understanding (Schusler, Decker, and Pfeffer 2003).

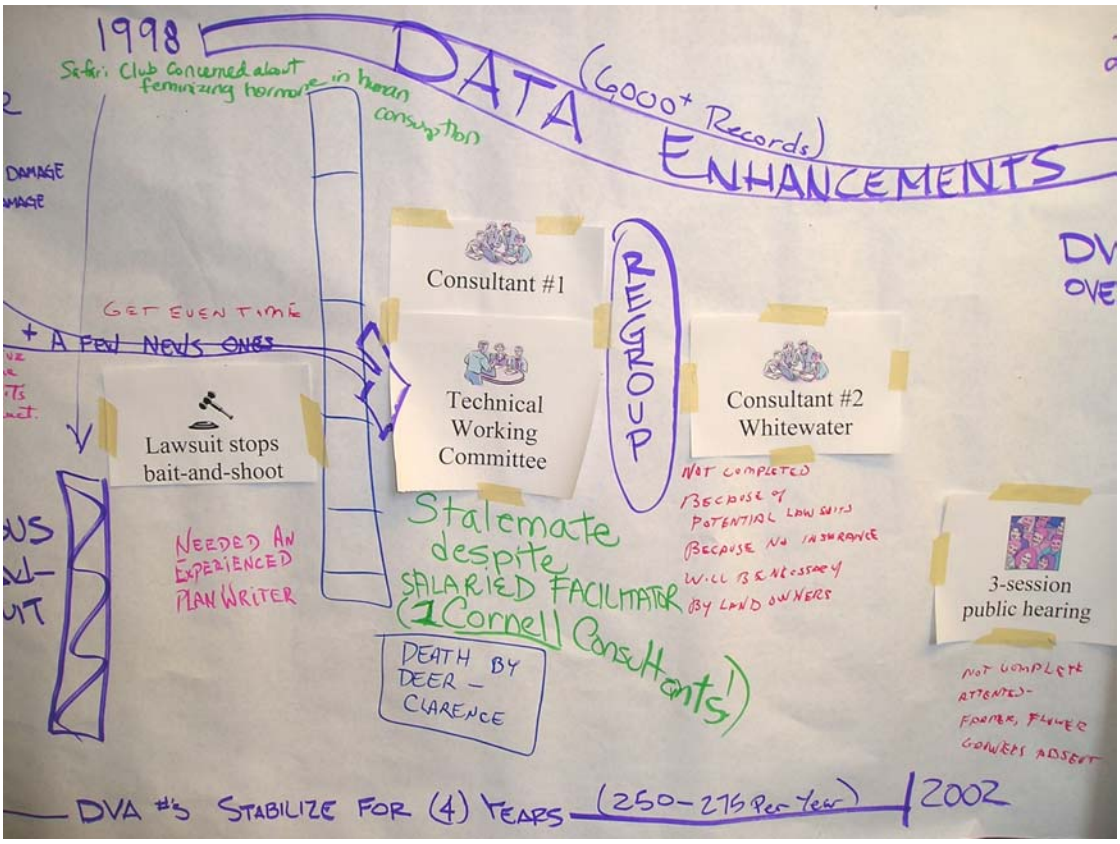

Figure 3. The Amherst shared history session resulted in a pictorial depiction of the evolution of the deer issue in that community.

Four of the six cases studied did not meet the criteria for a shared history. Instead of developing a shared history, we developed case descriptions for those four cases (Appendices B – G), and stakeholders were asked to review the descriptions individually for accuracy. Member checks such as these validate the researcher's analysis by asking if members recognize and understand the findings (Douglas 1976).

We also conducted a review of newspaper articles, meeting minutes, and press releases for each case. We reviewed documents to verify the chronology of events in each case and to provide a sense of the media's portrayal of the decision-making process.

We used interviews, shared histories, and document review to reveal: (1) criteria stakeholders use to measure the success of collaborative decision-making processes in community-based deer management, (2) factors that contribute to and inhibit the success of collaborative decision-making processes in this context, and (3) intervention activities that occurred at various stages in the evolution of the deer issue that developed stakeholder capacity to engage in collaborative decision making.

RESULTS

Issue Evolution

After crafting descriptions of each of the six cases (Appendices B – G), we analyzed each case in terms of issue evolution. This analysis exposes how the cases of collaborative deer management fit the theoretical model described by Hahn (1988). Figures 4 – 9 depict the deer issue evolution in each of the six cases.

As illustrated in the set of figures, deer issues do not surface and develop exactly as described by the Hahn model. Nevertheless, the model is a useful tool for understanding deer-issue evolution and identifying different stages as they emerge. Of the six cases selected for this study, only Wilbraham's deer issue closely followed the Hahn model from the concern stage through to the evaluation stage (Appendix E). Elements of the Hahn model are evident in all cases, however, and the model does indeed aid in analyzing the case history and status.

Criteria for Success

Stakeholder interviews from all six cases revealed criteria stakeholders use to assess the success of collaborative decision-making processes and the community-based deer management programs that result. Stakeholders involved in the six cases identified criteria for success that fall into the process, environmental outcome, and socioeconomic outcome categories described by Conley and Moote (2003). However, stakeholders also identified several other criteria that can be further categorized into two groups: impact outcomes and management performance. Impact outcome criteria measure whether the decision-making process and resulting management program alleviated negative impacts experienced by the community. Management performance criteria measure how well the management program was implemented and accepted by the community. The criteria identified by stakeholders were compiled and classified into the five categories identified above (Table 3).

Process criteria identified by stakeholders included having a diverse committee and a fair process. Of particular concern seems to be avoiding unnecessary divisiveness in a community, and the attendant adverse actions that are possible. For instance, one Cayuga Heights deer committee member stated that a successful collaborative decision-making process is one that "avoids legal action or lawsuits and keeps the community intact." An Amherst stakeholder added that a successful decision-making process results in "a decision that assimilates and reflects all interests genuinely."

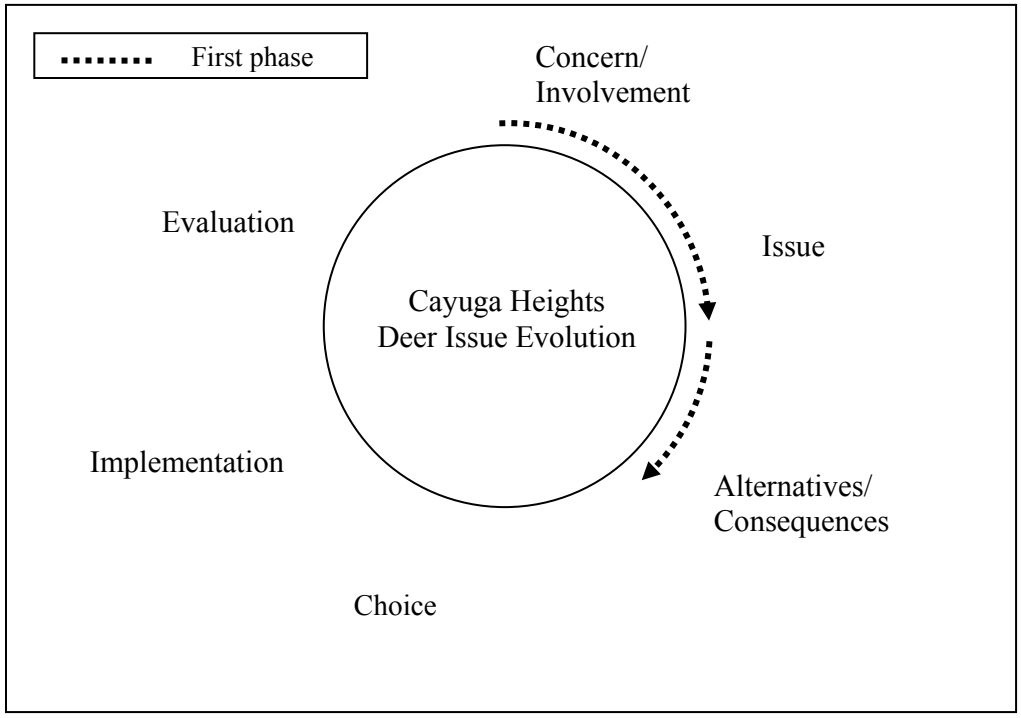

Figure 4. The evolution of the deer issue in Cayuga Heights, New York (Appendix B).

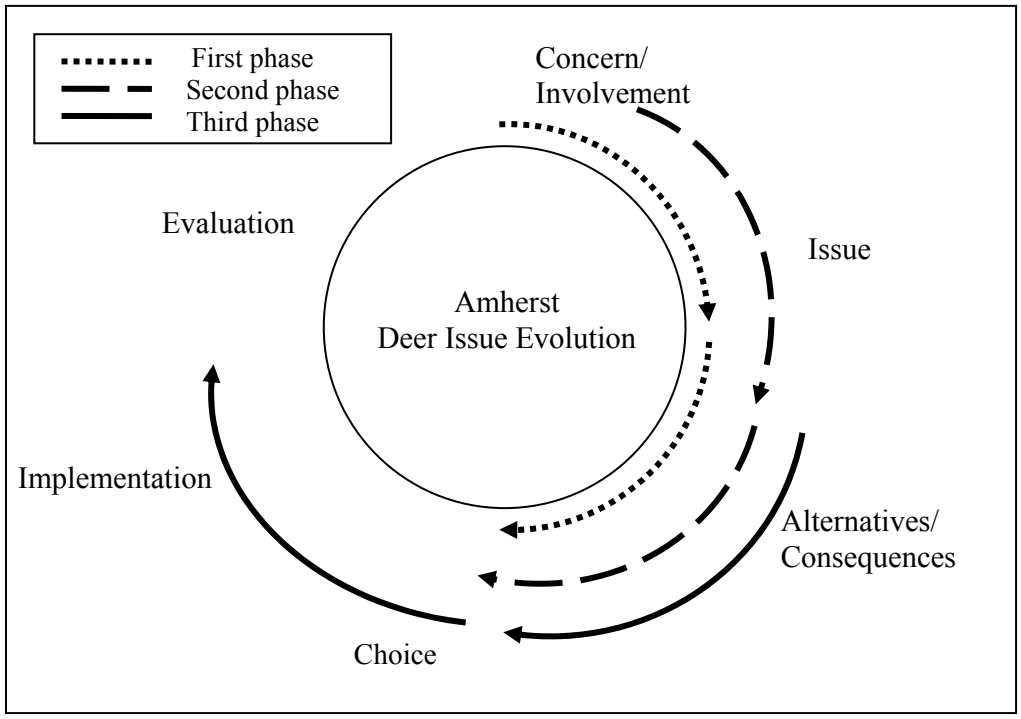

Figure 5. The evolution of the deer issue in Amherst, New York (Appendix C).

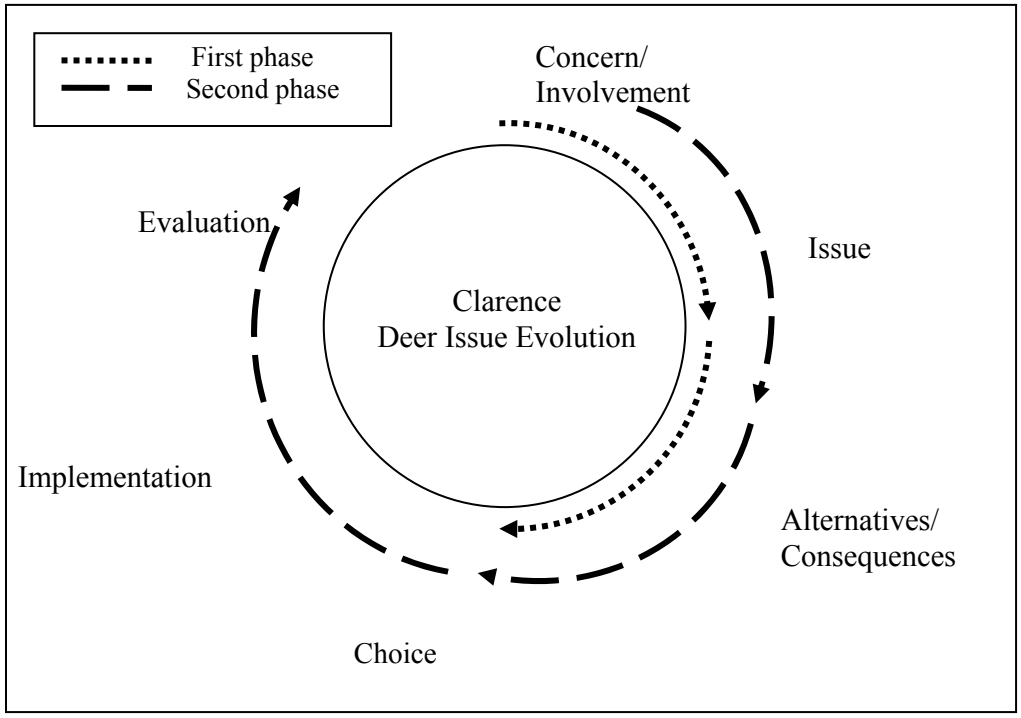

Figure 6. The evolution of the deer issue in Clarence, New York (Appendix D).

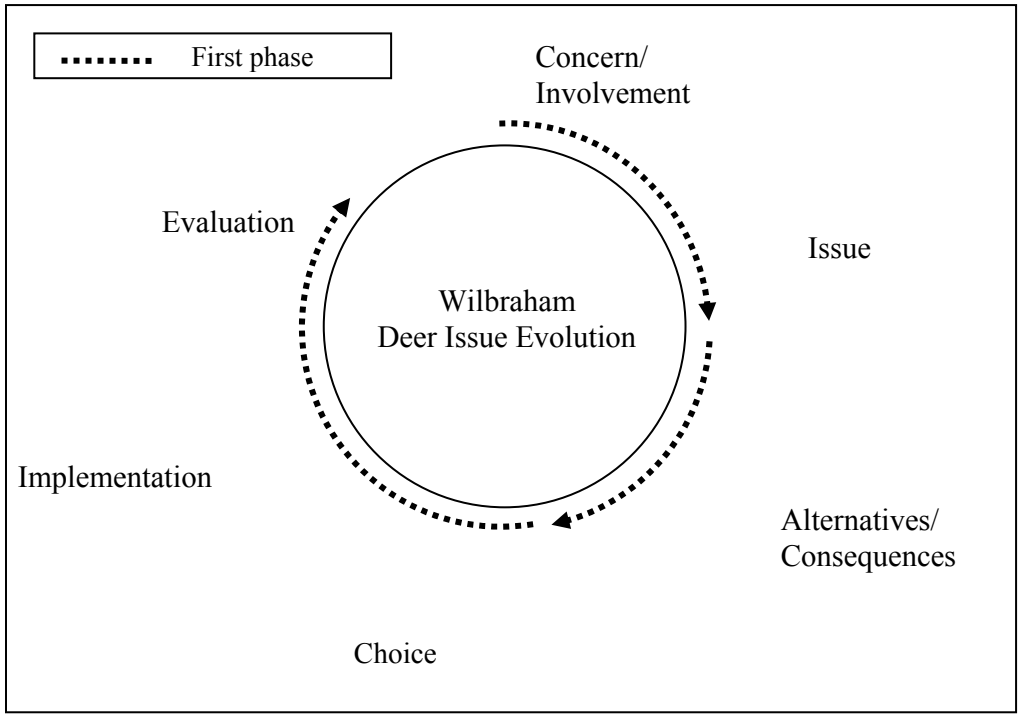

Figure 7. The evolution of the deer issue in Wilbraham, Massachusetts (Appendix E).

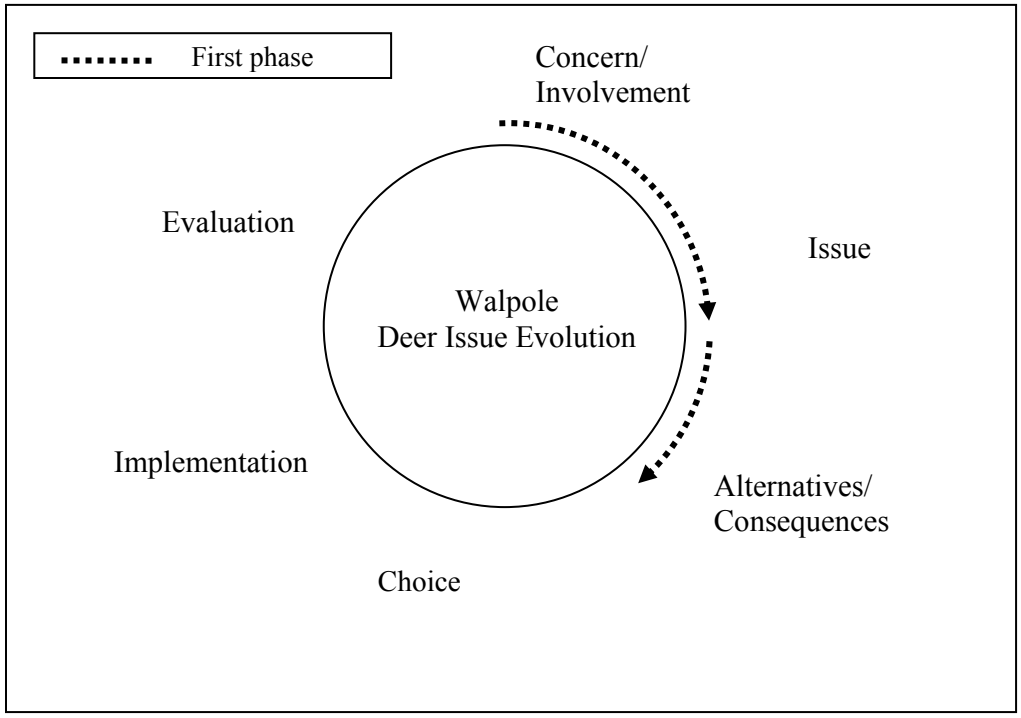

Figure 8. The evolution of the deer issue in Walpole, Massachusetts (Appendix F).

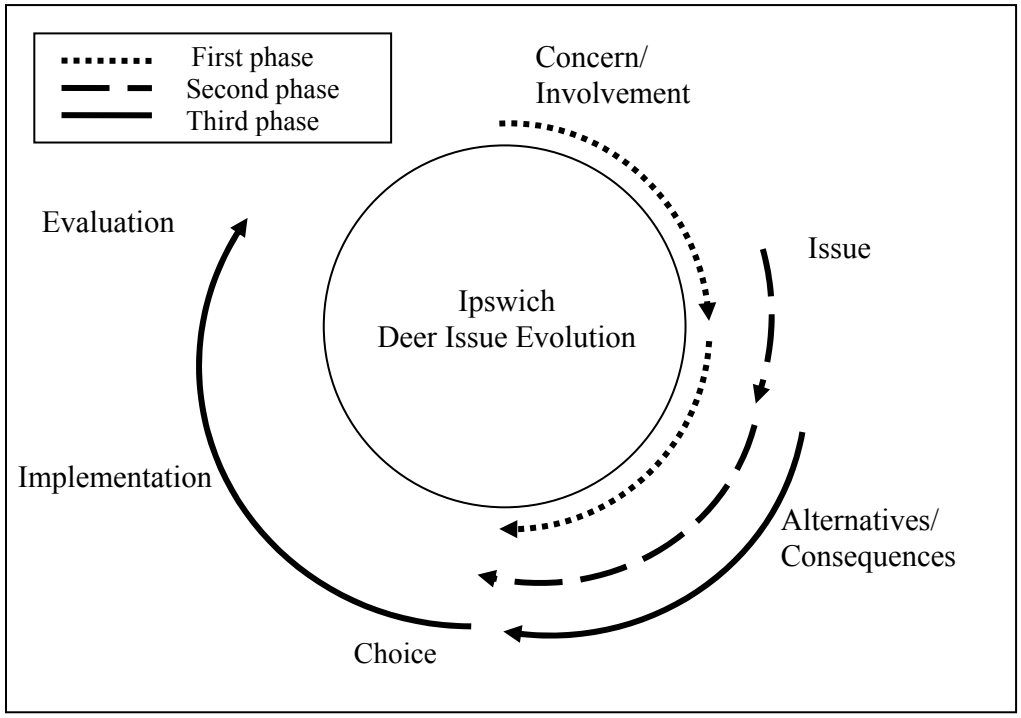

Figure 9. The evolution of the deer issue in Ipswich, Massachusetts (Appendix G).

Table 3. Criteria used by stakeholders to judge the success of community-based, collaborative decision-making processes and the resulting deer management programs.

Process[1]	Environmental outcome[3]	Socioeconomic outcome[3]	Impact outcome	Management performance
♦ A peaceful, collaborative decision-making process ♦ Public input / community involvement into decision-making ♦ Assimilation of all interests in the decision ♦ A committee with diverse representation ♦ Fair stakeholder involvement ♦ Divisive controversy is avoided ♦ Decision is a compromise	♦ Decrease in the tick population ♦ Fewer starving deer/ improved deer health ♦ Improved regeneration of forest ♦ Decrease in coyotes ♦ Decrease in number of deer ♦ Vegetation is protected ♦ Decrease in road-side carcasses	♦ More hunting opportunities for locals / increase in number of hunters ♦ Positive public reaction to program ♦ Good communication between the public and elected officials ♦ Decrease in controversy about the issue	♦ Decrease in deer-vehicle accidents ♦ Decrease in Lyme disease ♦ Decrease in property damage ♦ Decrease in shrub damage ♦ Increase in human health ♦ Decrease in crop damage / higher crop yields	♦ No complaints about archery program ♦ Increase in archery licenses issued ♦ State agency says deer population is under control ♦ Increase in deer harvest ♦ A safe hunting program ♦ An effective hunting program ♦ A genuine attempt to implement non-lethal methods ♦ Successful implementation of an adaptive deer management plan ♦ A plan with objectives based on scientific fact ♦ A balance between safety and the environment

[1] Conley and Moote 2003

Environmental outcome criteria identified by stakeholders included a "decrease in the tick population," and an "increase in forest regeneration." However, many of the stakeholders interviewed were not aware of the prevailing levels of the tick population or forest damage, and none of the stakeholders offered a numerical measure of acceptable decreases or increases. Evidently, in some cases such performance measures either were not articulated or not communicated to stakeholders post management implementation.

Stakeholders identified socioeconomic outcome criteria by which to measure the success of collaborative decision-making for community-based deer management. These included more hunting opportunities for local residents and positive public reaction to the deer management program. One Ipswich stakeholder emphasized the need for communication in observing that "a successful decision-making process results in an increase in the quantity and quality of communication between the Selectmen, the deer managers, and the public."

Impact outcome criteria were identified by all stakeholders in all six cases, and were often the driving motivation for stakeholders' involvement in collaborative decision-making. Many effects are created as people interact with wildlife and the natural landscape. The effects that people regard as being important enough to warrant management attention have been described as wildlife "impacts" (Riley et al. 2002). Common deer-human interactions in all six case studies included: deer sightings, deer-car collisions, deer damage to landscaping plants, and transmission of Lyme disease. Some of the impacts produced by these interactions were economic (e.g., some residents incurred costs for plant replacement and vehicle repairs), psychological (e.g., some residents experienced benefits from seeing deer or knowing deer were presence, others experienced frustration, anxiety, or worry about deer-related problems), and social (e.g., neighbors came into conflict over practices such as deer feeding and deer hunting). One Ipswich stakeholder noted that a successful decision-making process and deer management program require that "lots of time is spent on defining the problem in terms of impacts before proposing solutions."

Stakeholders also identified criteria for success in terms of management performance. The means by which the objectives of the program were met was important to many stakeholders, and they specified that success would be measured in terms of their preferred management actions. For instance, one Walpole resident stated that the decision-making process will be considered successful "when archery licenses are issued for Walpole."

Important Factors for Collaboration

Through stakeholder interviews we uncovered factors that contribute to and inhibit the success of collaborative decision-making processes in community-based suburban deer management (Tables 4a, 4b, 5a, 5b, 6a, and 6b). These factors fell into three broad categories: capacity, intervention, and context. The capacity and intervention factors had previously been revealed by experienced deer managers from across the northeastern U.S. who served as key informants during the developmental work for this study (Raik, Decker, and Siemer 2003). However, stakeholders also identified factors related to the situational context, and they were encouraged to define each factor in greater detail than had deer managers.

Capacity Factors:

Stakeholders identified factors that improved and inhibited collaborative decision making related to dimensions of institutional, community, and individual capacity (Raik, Decker, and Siemer 2003). These include partnerships, credibility, funding, relationships, common purpose, knowledge and leadership (Table 4a and 4b). The set of capacity-related factors identified by stakeholders surfaced several times, but the perception of whether a factor contributed to or inhibited decision-making differed. For instance, in the Cayuga Heights case, partnerships were identified as a dimension of institutional capacity important for collaborative decision making. However, partnerships were seen as both a contributing factor and an inhibiting factor by different Cayuga Heights stakeholders. One deer committee member observed that the partnership that existed among the village trustees, the local university, the state wildlife management agency, and the cooperative extension educator was "an essential component of the successful decision-making process" that took place. However, another deer committee member stated that the "institutional partnership of the wildlife agency and the university is overpowering. The playing field is not even despite an attempt at stakeholder involvement."

Stakeholders identified factors related to community capacity that enhanced and hindered the collaborative decision-making process in their communities. In Clarence, one stakeholder observed that the decision-making process proceeded smoothly in part because "a committee member's son is an employee of the wildlife agency." Informal and personal ties such as this facilitated communication in Clarence. However, other factors related to community capacity were identified as inhibitors of the decision-making process. Amherst stakeholders identified a lack of common purpose regarding means of achieving deer population reduction as a barrier to effective collaboration. One stakeholder stated that Amherst is a community with, "diverse opinions and interests. Although there may have been agreement on trying to reduce the number of deer-vehicle accidents in town, there was no agreement on how to do it." Evidently, having common goals with respect to deer population objectives is only one component of effective collaboration. Identifying commonly accepted means for achieving those goals is more difficult (Schusler, Decker, and Pfeffer 2003).

Dimensions of individual capacity also were identified as factors that contributed to and inhibited collaborative decision making. Leadership was identified by many as having contributed to the success of the decision-making process and the resulting management program. Cayuga Heights stakeholders emphasized the importance of strong facilitation leadership (effectiveness of process), while Wilbraham stakeholders noted the importance of official government leadership (legitimization of process). In Amherst, leadership was equated with coordinating activities such as compiling and disseminating data, communicating with the public, and holding meetings. In each case, leadership took a slightly different form and leadership responsibility fell to different individuals at different times. Likewise, a lack of leadership was identified as a barrier to effective collaboration, and stagnation in the process was often attributed to a change in leadership or a lack thereof.

Table 4a. Capacity factors believed by stakeholders to contribute to collaborative community-based deer management.

Capacity Dimensions that Contribute to Successful Collaboration		
Conceptual Category	**Capacity Dimension**	**Specific Manifestation of Capacity Dimension**
Institutional	Partnerships	♦ Partnership among involved entities ♦ Partnership among paid employees ♦ Collaboration between the town and state
	Credibility	♦ Credible institutions
	Funding	♦ External funding
Community	Relationships	♦ A personal relationship with the deer manager ♦ Trust among different groups
	Common Purpose	♦ Common purpose among committee members ♦ Little opposition
Individual	Knowledge/ Information	♦ Expert input ♦ Public awareness ♦ Credible information ♦ Hunter information session and packets ♦ Perception of archery as safe and quiet ♦ Information from various sources ♦ Scientific data/statistics ♦ Database of impact information
	Leadership	♦ Strong facilitation ♦ Support from elected officials ♦ A coordinating body or individual ♦ Credible leadership ♦ Persistent and dedicated leadership ♦ Constant leadership
	Credibility	♦ Credible experts

Table 4b. Capacity factors believed by stakeholders to inhibit collaborative community-based deer management.

Capacity Dimensions that Inhibit Successful Collaboration		
Conceptual Category	**Capacity Dimension**	**Specific Manifestation of Capacity Dimension**
Institutional	Partnerships	♦ Difficulty in getting many landowners to work in partnership ♦ Government agencies with opposing agendas ♦ Undefined roles of various entities/individuals
	Credibility	♦ Lack of institutional credibility (agency)
	Funding	♦ No funding
Community	Relationships	♦ Distrust among groups/individuals
	Common Purpose	♦ Diverse attitudes and values ♦ No common goal
Individual	Knowledge/ Information	♦ Not enough public awareness ♦ Not enough information
	Leadership	♦ Poor leadership ♦ Lack of good facilitation ♦ Divided leadership ♦ Reactive leadership (not proactive) ♦ Political leadership removed from the process
	Credibility	♦ n/a

Intervention Factors:

Intervention factors are processes that affect the development of capacity. Stakeholders identified several intervention factors that influenced the success of collaborative decision making in community-based deer management (Tables 5a and 5b). These factors included stakeholder involvement, education, communication, assessment, wildlife agency flexibility, and planning.

Stakeholder involvement is the process of engaging affected stakeholders for the purposes of providing input to decisions, participating in deliberations that result in decisions, or implementing decisions. In general, stakeholders usually include those with formal power to make the decision, those with the power to block the decision, those affected by the decision, and those with relevant information or expertise (Straus 2002). Although many stakeholders interviewed identified stakeholder involvement as important for collaborative decision making,

they differed in their perceptions of the benefits of stakeholder involvement. For instance, one Amherst stakeholder observed that stakeholder involvement

> "…is very important. It's not enough to involve everyone and have representation. You need to prove that everyone's interests are being met through action. The decisions need to reflect the diversity of the stakeholders."

However, another stakeholder from the same community felt quite differently and stated:

> "Too much public participation is a barrier to success. Stakeholders shouldn't be making the decisions, or even making recommendations to decision makers. They should be informants."

This diversity in perspectives is a challenge for collaborative decision making, but one that may be overcome through facilitation and deliberation (Straus 2002). This challenge may also be surmounted by using multiple methods of engagement, allowing for stakeholders with different preferences for extent and nature of input to participate as they like (Chase, Schusler, and Decker 2000).

Tables 5a. Intervention factors believed by stakeholders to contribute to collaborative community-based deer management.

Intervention Elements that Contribute to Successful Collaboration	
Intervention Element	**Specific Manifestation of Intervention Element**
Stakeholder Involvement	♦ A diverse committee ♦ Lots of public involvement ♦ Little public involvement ♦ Stakeholder interests reflected in decision
Education	♦ Public education
Communication	♦ Letters to residents ♦ Not too much publicity ♦ Communication with other communities ♦ Communication to the public via media ♦ Somewhat secretive program ♦ Communication among decision-makers
Assessment	
Wildlife Agency Flexibility	♦ Agency's flexibility ♦ Agency's support
Planning	♦ Planning the process ahead of time ♦ A monitoring program ♦ Definition of goals ♦ Guidelines for stakeholder involvement process

Tables 5b. Intervention factors believed by stakeholders to inhibit collaborative community-based deer management.

Intervention Elements that Inhibit Successful Collaboration	
Intervention Element	**Specific Manifestation of Intervention Element**
Stakeholder Involvement	♦ Not enough public support ♦ Lack of public participation from the beginning ♦ Too much public participation ♦ Some groups not brought into decision-making until late
Education	♦ Not enough education ♦ Trying to educate the public
Communication	♦ Not enough communication to the public ♦ No direct communication with other communities who had experience ♦ Not enough publicity ♦ Undefined goals / measures of success
Assessment	♦ No survey of residents' attitudes
Wildlife Agency Flexibility	♦ Fees and paperwork associated with permits
Planning	♦ No detailed plan of implementation that was agreed upon ♦ No management plan ready for decision-makers to consider ♦ Not planning a process that deliberately allows stakeholders to define the issue before jumping to solutions

Education was identified by stakeholders as a crucial element of intervention that can dramatically shape the decision-making process and the social environment of a management program. Education is defined in a variety of ways (e.g., Lindeman 1961; Palmer 1993). In this study, education is defined as the practice of contributing to individuals' knowledge and understanding of community-based deer management. In contrast to education, communication is defined as the process of providing information and increasing awareness of local deer issues. One Ipswich stakeholder described the role of education thus:

> "Education is key to garnering support. First we got the data out and lots of people in the area know a lot about the deer issue here. [Now] we need ongoing education about the management program."

Another Ipswich stakeholder noted that "…the main barrier is trying to educate the public before there's a personal, direct impact. This is very hard." Although education was identified as an important factor that contributed to the success of the decision-making process, it is also perceived to be difficult to implement an effective education program about deer management in community-based, collaborative decision-making processes about this issue.

Context Factors:

Context factors are attributes of the situational context that influence the success of collaborative decision making for community-based deer management (Tables 6a and 6b). The context factors identified by stakeholders included: time, power, emotion, and government structure.

Table 6a. Context factors believed by stakeholders to contribute to collaborative community-based deer management.

Context Factors that Contribute to Successful Collaboration	
Time	♦ Sufficient time
Power	♦ Opposing groups are perceived as outsiders and therefore have little power
Emotion	♦ Dread of impact ♦ Emotional connection to the issue
Government Structure	♦ Paid employees were responsible for addressing the issue ♦ Government structure pre-defined the decision-making process

Table 6b. Context factors believed by stakeholders to inhibit collaborative community-based deer management.

Context Factors that Inhibit Successful Collaboration	
Time	♦ Process too time-consuming
Power	♦ Not addressing issues of power and political agendas up front ♦ Manipulation of power inequalities ♦ Institutional partnerships that wield lots of power
Emotion	♦ The emotional nature of the issue ♦ Frustration about emotional nature of issue ♦ Moral opposition to lethal control
Government Structure	♦ Lawsuits ♦ Government avoidance of legal liability

Stakeholders from all six cases identified time as an important component of collaborative deer management. Some felt long periods of engagement of stakeholders in a process contributed to successful collaboration, while others felt that lengthy processes dissuaded participation and therefore inhibited success. For instance, one Cayuga Heights stakeholder observed that "we needed sufficient time to get everyone involved and up to speed with what

was going on. Had we been on some sort of schedule, things probably wouldn't have been done as thoroughly." However, another Cayuga Heights stakeholder said that "the decision-making process was too long." Evidently, collaborative deer management takes time. Providing stakeholders with accurate expectations in terms of time is important to ensuring sustained participation.

Power was identified as an important factor in collaborative decision making. One Cayuga Heights deer committee member observed that the decision-making process took place within a context of unequal power and stated that "…power inequality was not overtly discussed or brought to the table. We should have talked about the difference between institutional power and individual conviction."

Finally, interviews revealed that local government structure shapes the decision-making process significantly. In some cases, the government structure dictated the procedure for decision making about deer, whereas in other cases, a decision-making structure was created. For instance, Wilbraham stakeholders noted that the local government structure contributed to the effectiveness and efficiency of the decision-making process and program implementation. One stakeholder noted that the process ran smoothly because "paid town employees were responsible for addressing the issue and the government structure pre-defined the shape of the decision-making process."

The variety of perspectives expressed by stakeholders speaks to the need for communication in collaborative deer management. Stakeholders' expectations about the collaborative process often differed, and sometimes contradicted one another. These differences speak to the need for education and communication about what a collaborative deer management process will likely entail in a specific community. Articulating the likely steps to be taken, even in a speculative manner, may provide stakeholders with more accurate expectations and therefore alleviate some frustration with the collaborative process.

Important Factors for Collaboration during Evolution of a Deer Issue

The synthesis of concepts from issue evolution, issue education, and capacity described earlier provides a framework in which to analyze the information provided by stakeholders. Focusing on the capacity and intervention factors that contribute to success in collaborative decision-making provides insights as to how interventionists might make best use of their time and energy when engaging in community-based suburban deer management. However, integrating this information with how deer issues evolve provides a theoretical basis for designing intervention strategies.

Descriptions of each case resulting from interviews, document analysis, shared history, and member checks (Appendices B – G) expose how the dimensions of capacity and elements of intervention described by stakeholders manifest themselves at each stage of issue evolution. An analysis across all six cases of community-based collaborative deer management reveals that the same capacity dimensions and intervention elements were identified as important for the same stages across all cases. This trend holds true in cases that went through a single evolution cycle

or several phases of issue evolution. Table 7 describes intervention activities that took place in an attempt to develop capacity at each stage of issue evolution across all six cases.

Although these results from six cases do not represent a comprehensive set of possible intervention activities at each stage of issue evolution, they provide a reference for designing intervention strategies in community-based, collaborative deer management. The specific intervention activities undertaken at each stage of issue evolution are particularly useful for managers and other interventionists working to improve collaborative management.

OBSERVATIONS AND PATTERNS

This inquiry has uncovered some new and interesting facets of collaborative decision making for community-based deer management in suburban areas. First, stakeholders identified several classes of criteria they use for judging the success of collaborative deer management. Although all are important, the impact outcome criteria are a particularly interesting finding. These criteria, which are based on the deer-related impacts of concern to stakeholders, speak to the need for deer management based on impacts. Adaptive impact management (AIM) (Riley et al. 2002) may be useful for suburban deer management because it integrates both biological and social science. Collaborative, community-based deer management involving deer managers and a wide variety of stakeholders is a prime candidate for AIM.

Second, the cases examined here suggest that deer issues roughly follow the model of issue evolution described by Hahn (1988). The theory lays out a simple cycle that progresses from a few individuals expressing concern over an issue to a community-wide decision to implement action and evaluate effects. However, not all cases we studied followed this pattern exactly. In several cases, the deer issue went through several iterations of the issue evolution model, stagnating and reverting back to early stages of evolution. This finding is an important reminder to managers, interventionists, and researchers that differences often exist between theory and practice. One possible reason for this difference is that those individuals who are actively involved in decision-making may move through stages of evolution more quickly than the broader public. Several iterations of the issue evolution cycle, as seen in the Amherst case, suggest the need for intense education and communication efforts aimed at various segments of a community to avoid creating a gap between those most closely involved with the deer issue and the rest of the community.

Third, these results confirm the theoretical relationships among the concepts of issue evolution, capacity, and intervention. A strong relationship is apparent between stages of issue evolution and particular capacity needs. Different dimensions of capacity are more relevant at different stages of evolution. Figure 10 depicts the relationship between issue evolution and capacity as revealed from this inquiry.

Table 7. Important dimensions of capacity and elements of intervention at each stage of issue evolution in Amherst, New York.

Issue Evolution Stage	Dimension of Capacity	Element of Intervention	Specific Intervention Activities	Interventionist
Concern Involvement	♦ Relationships ♦ Knowledge ♦ Leadership	♦ Education ♦ Assessment ♦ Communication	♦ Assessments of deer impacts ♦ Communication with the public ♦ Education of stakeholders and the public ♦ Information collection ♦ Cultivation of leader or coordinator	♦ Land manager ♦ Deer manager
Issue	♦ Partnerships ♦ Relationships ♦ Common Purpose ♦ Knowledge ♦ Leadership ♦ Credibility (individual)	♦ Education ♦ Assessment ♦ Communication	♦ Education of stakeholders, the public, and decision-makers ♦ Information collection and analysis ♦ Communication with the public and decision-makers ♦ Partnering among affected groups and organizations ♦ Preparation for deliberation (planning of decision-making process) ♦ Inclusion of all stakeholders ♦ Definition of problem (establishment of common purpose) ♦ Articulation of criteria for success ♦ Verification of individual credibility ♦ Cultivation of trusting relationships	♦ Land manager ♦ The media ♦ Deer manager ♦ Interested groups and individuals ♦ Deer committee
Alternatives Consequences	♦ Partnerships ♦ Credibility (institutional) ♦ Relationships ♦ Common Purpose ♦ Knowledge	♦ Education ♦ Assessment ♦ Communication ♦ Stakeholder ♦ Involvement ♦ Agency Flexibility	♦ Information collection and analysis ♦ Experts are involved ♦ Wildlife agency articulates regulatory sidebars ♦ Partnerships are solidified ♦ Education of stakeholders, the public, and decision-makers ♦ Stakeholder deliberation ♦ Communication with the public and decision-makers ♦ Trusting relationships are cultivated ♦ Credibility of organizations verified	♦ Land manager ♦ Deer manager ♦ Other experts ♦ Deer committee ♦ The media

Table 7. Continued.

Issue Evolution Stage	Dimension of Capacity	Element of Intervention	Specific Intervention Activities	Interventionist
Choice	♦ Common Purpose ♦ Knowledge ♦ Leadership	♦ Education ♦ Communication	♦ Decision-makers are provided sufficient information to make their decision ♦ Decision-makers communicate their decision to stakeholders and the public ♦ A decision reflects a sense of common purpose in the community (not necessarily consensus)	♦ Land manager ♦ Deer manager ♦ Deer committee ♦ Interested groups and individuals ♦ The media
Implementation	♦ Partnerships ♦ Credibility (institutional) ♦ Relationships ♦ Common Purpose ♦ Leadership	♦ Education ♦ Communication	♦ Partnering groups divide implementation responsibility ♦ Trusting relationships continue to evolve ♦ Organizations exhibit professionalism ♦ Education of stakeholders, the public, and decision-makers ♦ Communication with stakeholders, the public, and decision-makers	♦ Land manager ♦ Deer manager ♦ Deer committee ♦ Interested groups and individuals ♦ The media
Evaluation	♦ Partnerships ♦ Relationships ♦ Knowledge ♦ Leadership	♦ Education ♦ Assessment ♦ Communication	♦ Partnering groups divide evaluation/monitoring responsibility ♦ Trusting relationships continue to evolve ♦ Education of stakeholders, the public, and decision-makers ♦ Communication with stakeholders, the public, and decision-makers ♦ Assessments of management program effectiveness are conducted	♦ Land manager ♦ Deer manager ♦ Deer committee ♦ Interested groups and individuals ♦ The media

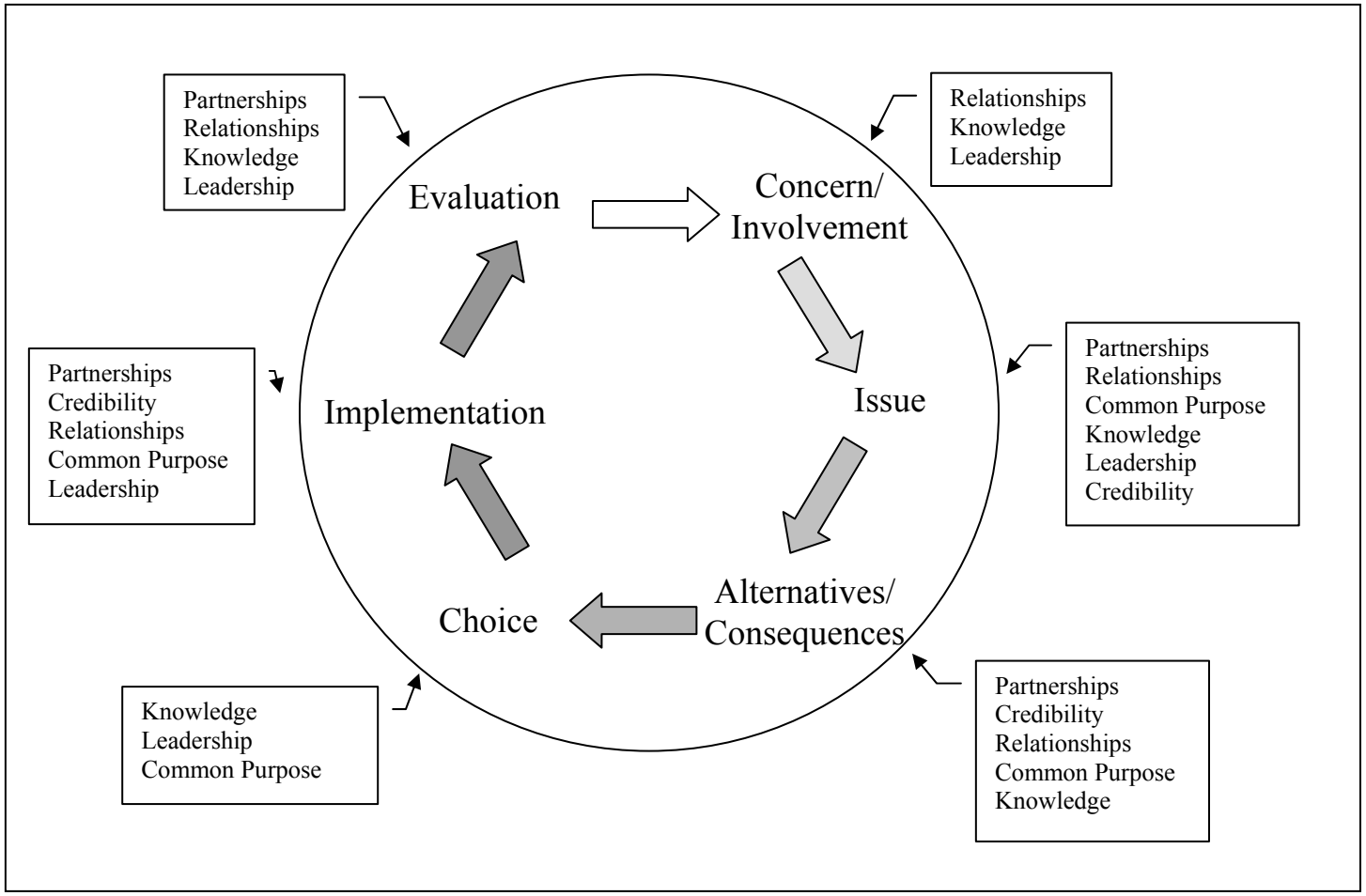

Figure 10. Important dimensions of capacity at each stage of issue evolution as revealed by all six cases.

In addition, specific intervention elements are appropriate for affecting change in different dimensions of capacity. Hahn (1988) theorized that specific educational activities should occur at different stages of evolution, and Hahn et al. (1994) uncovered several guiding principles for public policy education. This study confirms that several of those guiding principles are expressed in community-based deer management. For instance, Hahn et al. (1994) observe that public policy education programs are most successful when planned and implemented by a coalition of organizations. They define coalition broadly as a trusting partnership among two or more organizations. In the cases examined here, it seems that decision making was most satisfactory, if not perceived as most efficient, when driven by several entities working in a partnership. Partnerships took several forms, but all included a mixture of wildlife managers, local decision makers, and other affected individuals or groups.

In contrast to the Hahn study, this inquiry looks beyond education as a means of intervention and includes other elements of intervention such as communication, stakeholder involvement, and agency flexibility. In addition, the theoretical relationship between intervention and capacity was confirmed by this study. Stakeholders indicate that specific dimensions of capacity are most relevant to each stage of issue evolution and that a relationship exists between particular elements of intervention and dimensions of capacity. Knowing this provides managers and other interventionists with a guide for designing intervention programs that best meet local needs at the most opportune times to promote progress in addressing a deer issue. Identifying a community's capacity needs at a particular stage of deer issue evolution should lead to specific intervention activities, given the analysis of these six cases of collaborative deer management. For instance, at the alternatives and consequences stage, partnerships and knowledge are two important dimensions of capacity for effective decision making. Managers who wish to intervene effectively can design a program that includes stakeholder involvement and education, activities that promote the development of partnerships and the generation of knowledge. Figure 11 depicts the relationships as we see them among issue evolution, capacity, and intervention, based on this study.

Finally, dimensions of the context in which collaborative deer management occurred emerged as important for effective collaboration. Specifically, local government structure played a major role in shaping the decision-making process. In Massachusetts, communities are governed by boards of selectmen that identify local issues. However, they do not make many of the decisions affecting the community. Residents, or representatives from neighborhoods, vote on community issues during town meetings. This existing decision-making structure dictated many of the procedural considerations for decision-making about deer management. In contrast, most towns in New York are governed by town councils who have decision-making power for many community issues. Council members gather technical information and stay abreast of public opinion when making decisions. In these communities, the decision-making process that would be followed was created as the deer issue emerged. Both models for decision making can be effective given strong leadership. In the cases we examined, local lay and official leadership were both important for sustaining the decision-making process and management implementation. In the Massachusetts cases, leaders acted to collect information, educate stakeholders, and communicate with the public via media. In New York, leaders acted to engage stakeholders, facilitate meetings, gather information, and educate the public. While a pre-existing decision-making structure was initially more efficient in some cases, creating the

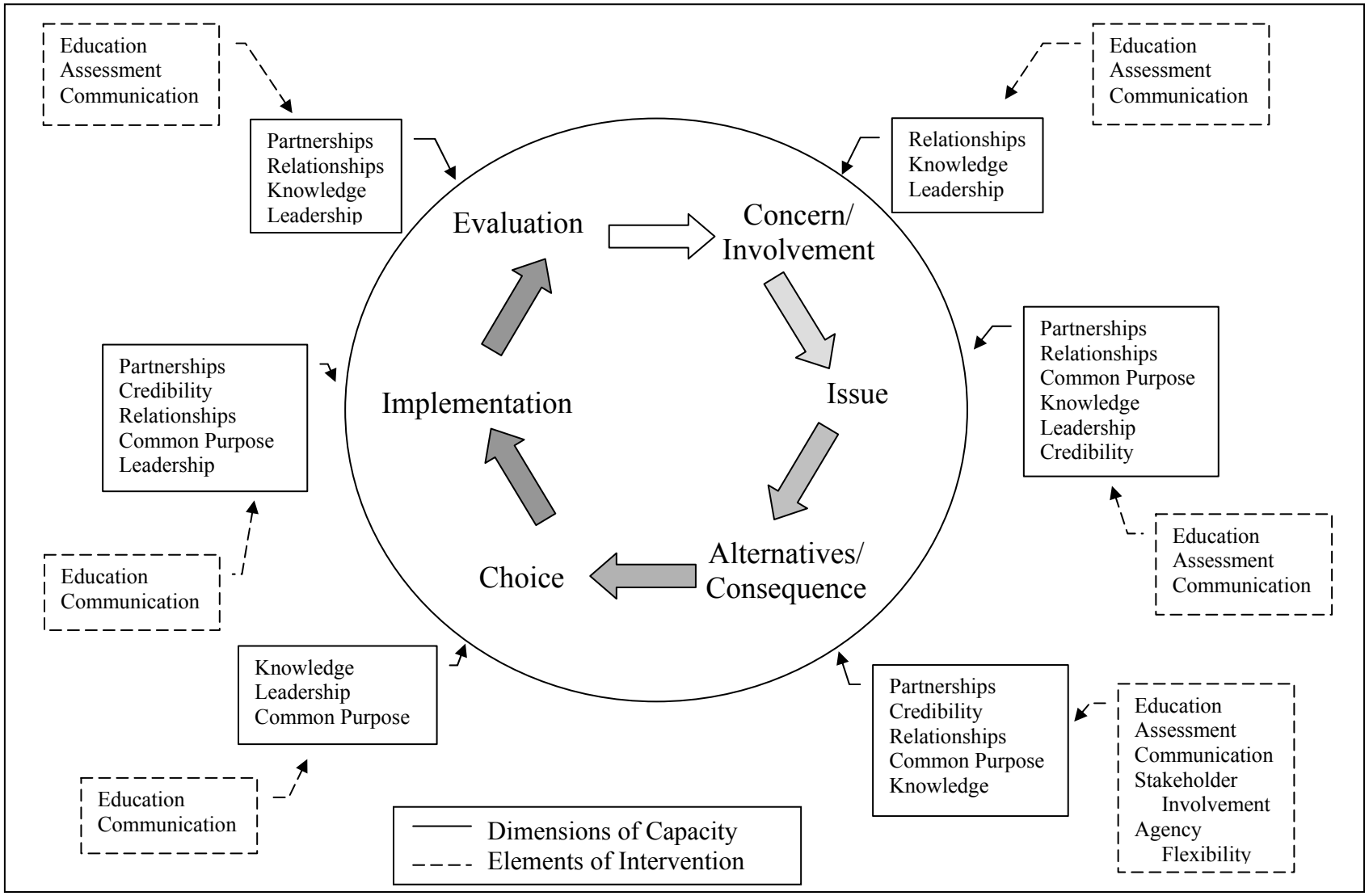

Figure 11. Important elements of intervention at each stage of issue evolution as revealed by all six cases.

decision-making structure seemed to ensure lasting ownership of the decision outcome because it involved more one-on-one deliberation among decision makers, stakeholders, and managers.

CONCLUSION

Stakeholders identified five types of criteria for judging the success of community-based collaborative decision making in deer management: process, environmental outcome, socioeconomic outcome, impact outcome, and management performance. Identifying these criteria when working through a collaborative decision-making process in deer management is generally recognized as a crucial first step for ensuring that stakeholders understand each other's interests and needs. Such an understanding will lead to a sense of common purpose, an important element of successful collaboration (Schusler, Decker, and Pfeffer 2003).

Stakeholders also identified factors that contributed to and inhibited the success of decision-making processes and resulting deer management programs. These factors relate to dimensions of capacity, elements of intervention, and the context. Factors related to institutional, community, and individual dimensions of capacity include: partnerships, credibility, funding, relationships, common purpose, knowledge, and leadership. Factors related to elements of intervention include: stakeholder involvement, education, communication, assessment, wildlife agency flexibility, and planning. Factors related to the context include: time, power, emotion, and government structure. Characterizing the context in terms of these factors, identifying the dimensions of capacity that are important for collaboration, and determining what forms of intervention will best contribute to the development of that capacity were important activities in collaborative decision-making processes we studied. We encourage interventionists (e.g., wildlife managers, community educators) designing decision-making processes for community-based wildlife management programs to consider these factors.

Capacity-building interventions are most effective when implemented at the most opportune times. Community-based deer management takes place in a context of issue evolution, and the stage of issue evolution determines in part the nature and degree of stakeholder capacity needs. Interventionists therefore must be aware of the evolution of the issue to anticipate what dimensions of capacity will be most needed and therefore what intervention strategies to implement.

This study does not provide an infallible recipe for successful collaborative decision making for community-based deer management, but it does suggest considerations for wildlife professionals and other interventionists interested in designing strategies to enhance the quality of collaborative decision-making processes:

- Identify the communities' historic and current physical environment as related to deer ecology and management.

- Determine who the affected individuals and groups are and what skills and assets each brings to the collaborative decision-making process.

- Determine how far the deer issue has evolved

- Identify criteria that will be used to assess the success of the decision-making process and the deer management program from the stakeholders' perspective.

- Determine the nature of the social environment in which decision-making will take place (e.g., major players, issues of power, government structure, etc.).

- Determine which dimensions of capacity are most needed at the current stage of deer-issue evolution.

- Design intervention strategies that deliberately attempt to build the most relevant dimensions of capacity.

With these considerations in mind, we believe that collaborative decision making for community-based, suburban deer management can be facilitated. However, further research is needed to evaluate the utility of an intervention strategy based on these findings. A study that evaluates the implementation of such an intervention could lead to refinements (and confidence) in these guidelines. We hope to conduct this second phase of inquiry with a new round of funding, consistent with the original intent of this overall project. Also, other cases should be explored to determine if additional dimensions of capacity and elements of intervention exist that are important for successful collaboration.

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APPENDIX A -- Case Study Interview Schedule

The interviews of stakeholders were one-hour, in-person interviews. They were tape-recorded with permission of the interviewee. The purpose of the interview was to: (1) gain a broad understanding of the sequence of events from the interviewee's perspective, (2) understand the interviewee's motivation for participation, and (3) understand factors that contributed to or hindered the process in general, and the interviewee's participation in the process in particular.

1. When did you first become involved in the deer issue?

2. Why did you become involved?

3. Can you give me an outline of the sequence of events? How did the issue develop over time (maybe draw a timeline?)

4. What happened/who was involved at point X?

5. Why did Y occur at point X?

6. What were some of the important factors that contributed to your participation?

7. What were some of the inhibiting factors? How did you overcome those?

8. Who would you say were the major players (individuals or entities)?

    a. What roles did each of them play?

    b. What qualities did they exhibit that were important?

9. Would you characterize this process as a success? Why or why not?

10. What are your criteria for success?

11. What did you learn as a result of your involvement? Do you feel you gained anything from your involvement?

12. If you were to do it again, what would you do differently?

13. Have you subsequently been involved in other community-related activities that you would not have otherwise?

14. What advice would you give for a community that is just starting down the road of community-based deer management?

APPENDIX B -- Cayuga Heights Case Description

The Village of Cayuga Heights is a relatively affluent residential community located in central New York. It is governed by a village mayor and a six-member board of trustees. With the exception of a small park, all land in the village is privately owned. Discharge of firearms is illegal in the village. Bow-hunting remains legal in the village, but little or no bow-hunting occurs because state law prohibits discharge of a firearm or bow and arrow within 500 feet of a dwelling without the landowner's permission.

Deer managers began receiving complaints about deer-related problems from Cayuga Heights residents in the mid-1990s. In 1998, a group of about a dozen village residents gathered hundreds of signatures on a petition calling for action by the New York State Department of Environmental Conservation (NYSDEC) to address concerns about deer damage to gardens and landscape plantings. By August of 1998, the same individuals had approached their village mayor and had been officially sanctioned by the village as a committee to study the deer situation and develop recommendations for the village trustees.

The deer committee quickly formed a close working relationship with staff from NYSDEC, Cornell University, and Cornell Cooperative Extension (CCE). The deer committee invited an environmental educator with CCE to provide them with information about techniques to reduce deer damage to landscape plants. At the committee's invitation, this extension educator assisted with design and facilitation of citizen-involvement processes. Through her efforts, the deer committee came to have direct and repeated interactions with NYSDEC staff and the State Wildlife Specialist for CCE.

The extension educator worked with the deer committee to design a process for gathering public input. Eventually, the deer committee designed a process that included input from several sources: (1) two mail surveys of village property owners; (2) two studies of deer abundance and movements; (3) a committee fact-finding process; (4) two public meetings with village residents; (5) and discussions with invited technical experts on reproductive control in free-ranging deer. The deer committee met 40 times between fall 1998 and May 2001 to gather information, define their situation, and deliberate about problems and potential responses to those problems. CCE personnel and NYSDEC staff provided the deer committee with information about deer and deer management. NYSDEC staff provided them with information about laws, statutes, and policies that would be brought into consideration if deer population reduction were recommended. To facilitate the deer committee's work, NYSDEC provided partial funding for Cornell's Human Dimensions Research Unit (HDRU) to survey village property owners about their experiences with deer, opinions on deer management, and preferred modes of involvement in deer management decisions. Staff associated with HDRU, CCE, and NYSDEC worked closely with the committee to synthesize and interpret survey findings and communicate those findings to village residents. With assistance from a range of technical experts, village residents defined problems, proposed management alternatives, and evaluated consequences of action alternatives.

By February 2001, there seemed to be substantial agreement that the majority of homeowners in the village were experiencing deer-related problems and desired relief from those problems, but residents were divided on how to reduce negative interactions with deer.

After two years of issue investigation and deliberation, the deer committee made a formal recommendation to the village trustees. They recommended that the village endorse experimental research that included physical sterilization of some deer in the village, along with euthanization of some deer captured during the experimental research. The recommendations came with an offer from an anonymous village resident to fund the experimental study. The village trustees accepted the recommendation. The NYSDEC subsequently granted a permit necessary for the experiment to proceed. The deer sterilization experimental research was initiated in late 2002 and continued in early 2003.

Issue Evolution

The Cayuga Heights deer case followed the issue-evolution cycle from the concern and involvement stages, to the issue, alternatives and consequences stages. There it stalled. The choice and implementation stages have not yet been experienced. Instead, the community chose to pursue a deer sterilization experiment, which is a research activity, not management action.

Capacity

Concern and Involvement Stages – The concern and involvement stages of issue evolution occurred in a spontaneous, organic manner in the Cayuga Heights case. Residents experiencing negative impacts from deer began talking with one another and over time decided to form an ad hoc group. During this time, residents assessed the impacts they were experiencing, educated one another, exchanged information, and exercised leadership by agreeing to take responsibility for addressing the issue.

Issue Stage – After some Cayuga Heights residents had established that deer management was a public issue affecting the community, they approached the village trustees. At this stage, the deer committee was established, and a partnership formed among the HDRU, CCE, NYSDEC, and the committee. Information gathering was an essential component of this stage as all parties strived to increase their knowledge of the issue. The deer committee and other groups also took steps to inform the public of the deliberation occurring around deer issues in the community.

Alternatives and Consequences Stages – The alternatives and consequences stages of issue evolution took a great deal of time in the Cayuga Heights case. At this stage, implicated entities worked to understand each other's interests and come to a decision that was fair. Stakeholder involvement and deliberation was an important part of this stage. In deciding to engage in additional experimentation before deciding upon a management action, Cayuga Heights has prolonged this stage. NYSDEC demonstrated its flexibility by agreeing to allow additional experimentation. There has been a great deal of media coverage and public education during this stage as well.

Table B1. Issue evolution stages, dimensions of capacity, and interventions expressed in Cayuga Heights, New York.

Issue Evolution Stage	Dimension of Capacity	Element of Intervention
First Phase		
Concern/ Involvement	♦ Knowledge ♦ Leadership	♦ Education ♦ Assessment
Issue	♦ Knowledge ♦ Partnerships	♦ Education ♦ Informative Communication
Alternatives/ Consequences	♦ Knowledge ♦ Partnerships ♦ Credibility	♦ Education ♦ Informative Communication ♦ Stakeholder Involvement ♦ Agency Flexibility

APPENDIX C -- Amherst Case Description

The Town of Amherst is located in Erie County, New York. It has a population of approximately 100,000 residents. The southern 2/3 of the town is urban/suburban and the northern third is farmland or early succession forest. Amherst is governed by an elected town supervisor and an elected town council made up of six members, who identify public issues, set the agenda for town council meetings, and vote on issues. The supervisor and council members are elected to four-year terms.

Most of New York State was closed to hunting in the late 1800s. In 1945, some parts of Erie County were opened to hunting, but Amherst stayed closed. As deer populations increased, the New York State Department of Environmental Conservation (NYSDEC) became concerned that the no-hunting law in Amherst and surrounding areas was resulting in an unacceptable level of negative impacts from deer. In 1987 NYSDEC gathered support from Amherst town officials and proposed opening Amherst and other closed areas of Erie County to bow hunting. The proposal passed with an amendment that stated that any municipality could decide whether it wanted hunting on its property. However, the bill was vetoed by the Governor because of the amendment.

After the veto, NYSDEC staff realized that one problem with the original proposal was that it did not have sufficient public support to pass without the amendment. In 1988 NYSDEC staff visited with every town board implicated in the proposed legislation. Although the intent had been to re-introduce the bill, that never occurred.

Negative impacts from deer in Amherst continued into the early 1990s. In 1991 the Amherst Conservation Advisory Council (ACAC) was charged with studying the deer issue and coming up with recommendations. They produced a report that documented deer-vehicle accidents in town, the deer-related impact of concern to most Amherst residents.

Throughout this period NYSDEC continued reacting to damage complaints by issuing nuisance permits to individual landowners. In 1994 the sitting town supervisor contacted NYSDEC to address the issue of deer-vehicle accidents in town (443 dead deer were picked up from Amherst roads that year). In response, a bait-and-shoot program was implemented that winter. Under this program, NYSDEC issued a nuisance permit to the Town of Amherst and hunting took place on public land. There was little public input leading up to this decision and therefore several newspaper articles expressed opposition to the program. The program was controversial and although NYSDEC and the town government described it as a success (290 dead deer were collected from roadsides in 1995), animal rights groups and some factions of the public called the decision-making process un-democratic and the program inhumane.

In March of 1996 the town council passed a resolution to extend the bait-and-shoot program. A grassroots movement developed and the Citizens Concerned about Violence Against Deer filed a lawsuit against the town for failure to comply with the State Environmental Quality Review Act (SEQRA) prior to adopting a March 4, 1996 resolution extending bait-and-shoot for three years and to suspend the town's firearms discharge ordinance. This claim stopped the bait-and-shoot program. The same year, experts from the Humane Society of the United States

(HSUS) and the local university were brought in to study the issue and contribute to an informed discourse. In addition, the town council received a donation from a private citizen to study non-lethal means for reducing the deer population.

The 1997 elections brought in a new town supervisor who established the supervisor's task force to study the deer issue and make recommendations. The gift money was used in part to fund the group to collect information. The HSUS received a permit from the NYSDEC to conduct an immuno-contraception feasibility study on deer in Amherst. At the same time, stakeholder meetings were held in Amherst to define the problem. It was identified that Amherst residents suffered from three main impacts from deer: deer-vehicle accidents, crop damage, and private property damage, but that the deer-vehicle accidents were the main impact of concern.

In late 1997 a small contingency of local sportsmen, filed a lawsuit against the town, NYSDEC, HSUS, and others for failure to comply with the SEQRA prior to issuance of a license for the feasibility project. This claim halted the HSUS immuno-contraception study. The NYSDEC admitted error with respect to the petitioners SEQRA claim, the judge dismissed the case as moot, and the matter was remanded to NYSDEC for further proceedings in accordance with the law.

In 1998 the Amherst Planning Department collected records from the Amherst Police Department, catalogued and verified deer-vehicle accident information, and used Geographic Information System (GIS) to identify hotspots.

After a lull in activity, the supervisor's task force was re-incarnated and named the Technical Working Committee, which was made up of the original task force members as well as some additional people. A consultant was hired by the town to facilitate public involvement and write a deer management plan. After about a year, it was clear that no progress had been made and the town decided to regroup.

A new consultant was hired to work with the Planning Department to facilitate public involvement and write a deer management plan. The environmental impact statement procedure was followed and the Town of Amherst Deer-Vehicle Accident Management Plan was approved in January 2003. Originally, the plan called for three years of implementation and monitoring of non-lethal tools for managing deer vehicle accidents and use of nuisance permits before returning to a bait-and-shoot program. However, due to a significant increase in deer-vehicle accidents (180) in 2002, several council members expressed dissatisfaction with this plan. The council amended the plan to reflect a majority decision to wait only one year before starting bait-and-shoot. The plan was adopted as amended.

Issue Evolution

The Amherst deer issue evolved in three phases. In the first phase the issue evolved from the concern stage to the choice stage. In the second phase the issue reverted back to the issue stage and then evolved through to the implementation stage. In the third phase, the issue spent several years at the alternatives/consequences stage, evolved through the choice stage, and is currently in the implementation stage.

The first phase of the Amherst deer issue evolved quickly from the concern stage to the choice stage because the issue was identified by NYSDEC without much involvement from the town government or residents. NYSDEC staff identified the no-hunting law as a barrier to effective deer management in the concern, involvement, and issue stages. Without much deliberation the issue moved rapidly through the alternatives and consequences stages as changing the legislation was identified as an acceptable solution. The choice stage occurred when the bill was passed by legislation and subsequently vetoed by the Governor.

Without a resolution or action plan, negative impacts from deer continued in Amherst. In the second phase, the issue reverted to the issue stage as town officials gathered additional information and worked with NYSEC staff to implement deer management. However, there was little public input and the alternatives and consequences stages were moved through very quickly. With in put from NYSDEC, the town council decided to implement a bait-and-shoot program on town land whereby the town was issued nuisance permits. The bait-and-shoot program was implemented until a lawsuit put an end to the program.

The third phase of issue evolution occurred after the lawsuit blocked the bait-and-shoot program. At this point the issue entered the alternatives and consequences stages as NYSDEC, town officials, Amherst residents, and other interested parties worked to gather information and consider alternative management actions. This phase lasted nearly six years as different studies were implemented, another lawsuit was filed, consultants were hired, and management plans were written. Finally, in 2003, the issue entered the choice stage when the Town of Amherst Deer-Vehicle Accident Management Plan was finalized and approved by the town council. The issue is currently in the implementation stage and has not yet reached the evaluation stage.

Capacity

Concern, Involvement, and Issue Stages – In both the first and second phases of issue evolution in the Amherst case, the capacity dimensions of knowledge and leadership played prominent roles in the concern/involvement/issue stages. In the first phase, NYSDEC staff worked with state legislators to conduct an assessment of the deer situation in Amherst and educate themselves about courses of action. NYSDEC staff relied upon their knowledge of deer biology and management when assessing the situation and exhibited leadership in bringing a proposal for legislation to the state legislature. In the second phase, the Amherst town council exercised leadership in approaching NYSDEC about the deer issue. Council members were educated by NYSDEC staff and communicated their positions to the public via press releases and other media.

Alternatives/Consequences Stages – In all three phases of issue evolution, knowledge played an important role at the alternatives/consequences stage. However, in the second phase, leadership was important, whereas in the third phase, partnerships, relationships, and credibility contributed to the decision-making process. In the first phase, the alternatives/consequences stage was skipped over very quickly. NYSDEC staff relied upon their expertise in deer management and quickly decided that the best management action would be to reduce the

number of deer and that the current legislation was blocking this action. NYSDEC demonstrated its flexibility in continuing to issue nuisance permits.

In the second phase, the alternatives/consequences stages were passed through fairly quickly. Amherst town officials and NYSDEC formed a partnership and worked to increase each other's knowledge about the local deer situation and possible management options. They communicated their positions to the public via press releases and other media.

In the third phase of the Amherst case, the capacity dimensions of knowledge, partnerships, relationships, and credibility all played an important role in the alternatives/consequences stage. Over time, the town council, the planning department, NYSDEC, stakeholders, consultants, experts, and interest groups worked in partnership to define the issue, consider alternatives, and find common purpose. Credible information and communication via media became necessary resources for deliberation and stakeholder involvement that contributed to trusting relationships.

Choice Stage – In all three phases of the Amherst deer issue, knowledge played an important role in the choice stage. In the first phase, NYSDEC staff worked to educate state legislators so that they had adequate and accurate knowledge with which to make a decision. In the second phase, Amherst's elected leaders relied upon their knowledge of deer management when they voted to implement a bait-and-shoot program. In the third phase, relationships among individuals in town led to a sense of common purpose, which facilitated the approval of the Town of Amherst Deer-Vehicle Accident Management Plan.

Implementation Stage – The implementation stage was reached in the second and third phases of issue evolution in this case. Partnerships were very important to the success of this stage of issue evolution, evident in the coordination exhibited among the Amherst town council, planning department, the NYSDEC, hunting organizations, and the consulting group. Communicating the details of deer management implementation contributed to sustained public support for the program.

Table C1. Issue evolution stages, dimensions of capacity, and interventions expressed in Amherst, New York.

Issue Evolution Stage	Dimension of Capacity	Element of Intervention
First Phase		
Concern/ Involvement/ Issue	♦ Knowledge ♦ Leadership	♦ Education ♦ Assessment
Alternatives/ Consequences	♦ Knowledge	♦ Education ♦ Agency Flexibility
Choice	♦ Knowledge	♦ Education
Second Phase		
Issue	♦ Knowledge ♦ Leadership	♦ Education ♦ Informative Communication
Alternatives/ Consequences	♦ Knowledge ♦ Partnership	♦ Education ♦ Informative Communication ♦ Agency Flexibility
Choice	♦ Knowledge ♦ Leadership	♦ Education
Implementation	♦ Partnership	♦ Informative Communication
Third Phase		
Alternatives/ Consequences	♦ Knowledge ♦ Partnerships ♦ Relationships ♦ Credibility	♦ Education ♦ Informative Communication ♦ Agency Flexibility ♦ Stakeholder Involvement
Choice	♦ Common Purpose ♦ Knowledge	♦ Relationships ♦ Education
Implementation	♦ Partnerships	♦ Informative Communication

APPENDIX D -- Clarence Case Description

The Town of Clarence is located in Erie County, New York. It is a suburban area with a considerable amount of green space. Clarence has a population of approximately 25,000 residents and is governed by an elected town supervisor and an elected, four-member town council. The town council is responsible for identifying public issues, encouraging deliberation, setting the agenda for town council meetings, and voting on issues.

Most of New York State had been closed to hunting since the late 1800s. In 1945, some parts of Erie County were opened to hunting, but the southern third of Clarence stayed closed. As deer populations increased, the New York State Department of Environmental Conservation (NYSDEC) became concerned that the no-hunting law in the southern portion of Clarence was resulting in an unacceptable level of negative impacts from deer. In 1987 NYSDEC met with Clarence town officials and other municipalities in Erie County. With their support, NYSDEC proposed changing state legislation to open the southern portion of Clarence and other closed areas of Erie County to bow hunting. The proposal passed in the state legislature with an amendment that stated that any municipality could decide whether it wanted hunting on its property. However, the bill was vetoed by the Governor because of the amendment.

After the veto, NYSDEC met with the Clarence town council and they passed a resolution legalizing bow-hunting in the southern portion of the town. However, the resolution had little effect.

Several years passed with little activity. NYSDEC continued reacting to individual deer complaints by issuing nuisance permits that allowed individual landowners to take deer on their property.

In the late 1990s the town council started receiving an increasing number of complaints about deer in town. The Clarence Conservation Advisory Council (CCAC) was charged with studying the issue and making recommendations for actions. In 1998 the CCAC met with NYSDEC staff, collected information from the internet, other communities, and Cornell University, and met with individuals in Amherst, an adjacent town, who had taken steps to address a similar issue in that town. NYSDEC recommended that the no-hunting zone of Clarence be opened up to bow hunting.

Meanwhile, a Clarence resident was killed in a deer-vehicle accident in 1998. This received media attention and provided additional momentum to address the issue. There were some letters to the editor opposing opening the no-hunting zone, but overall, the level of controversy was fairly low.

In 1999 the Town of Clarence funded a fly-over to estimate the number of deer in town and to identify what areas of town were most densely populated. The town council then passed another resolution to open the closed section of town to archery and sent it to the local state

representative and state legislator. However, they never passed the resolution on to the legislature as a whole, so it went no further.

The following year, the town supervisor called a meeting with a NYSDEC biologist, the town attorney, a few council members, and some Clarence residents. After discussing management options, it was decided that NYSDEC would issue additional nuisance permits to private landowners, invoking the sections of the law that justify the use of such purpose based on agricultural damage, forest regeneration damage, and public safety. The CCAC accepted the responsibility for coordinating this effort.

The CCAC identified landowners whose parcels of land were large enough to sustain bow hunting and approached them about allowing hunters on their property. The CCAC also identified volunteer shooters and gave their names to NYSDEC for screening and approval. There were a few articles in the local paper about the new program, but it was not widely publicized.

In 2001 the CCAC and NYSDEC held an orientation workshop for all hunters participating in the program. The purpose and rules of the program were explained. One of the stipulations of participation in this program was that all deer were donated to a food bank. The first year, 215 deer were taken and 5500 lbs. of venison went to the food bank of western New York. Other stipulations of the program included: only antlerless deer could be taken, shotgun or bow could be used from an elevated platform, and bait should be used to lure deer close for an easier shot. The program has continued each year since then, but there is some indication that as more landowners become involved and the public becomes aware of the program some opposition is beginning to surface.

Issue Evolution

The Clarence deer issue evolved in two phases. In the first phase the issue evolved from the concern stage to the choice stage. In the second phase the issue went back to the concern stage and evolved through to the evaluation stage.

The first phase of the Clarence deer issue evolved quickly from the concern stage to the choice stage because the issue was identified by NYSDEC without much involvement from the town government or residents. NYSDEC staff identified the no-hunting law as a barrier to effective deer management in the concern, involvement, and issue stages. Without much deliberation the issue moved rapidly through the alternatives and consequences stages as changing the no-hunting legislation was identified as an acceptable solution. The choice stage occurred when the bill was passed by legislation and subsequently vetoed by the Governor.

Without a resolution or action plan, negative impacts from deer continued in Clarence. In the second phase, the issue reverted to the concern stage. Increasing complaints about deer led the town council to seek action. The alternatives and consequences stages occurred at a meeting called by the town supervisor. At this meeting, alternative management actions were discussed and it was decided that NYSDEC would issue a large number of deer damage permits to Clarence landowners and the Town of Clarence would administrate the program.

Implementation occurred quickly thereafter. Data regarding numbers of deer harvested are being collected, but the program has not yet been formally evaluated with respect to its goals. It is unclear how the issue will continue to develop as public awareness of the program brings the potential for controversy.

Capacity

Concern, Involvement, and Issue Stages – In both the first and second phases of issue evolution in the Clarence case, the capacity dimensions of knowledge and leadership were important. In the first phase, NYSDEC staff worked with state legislators to conduct an assessment of the deer situation in Clarence and Erie County, and to educate themselves about courses of action. NYSDEC staff relied upon their knowledge of deer biology and management when assessing the situation and exhibited leadership in bringing a proposal for legislation change to the state legislature. In the second phase, the Clarence town supervisor and council exercised leadership in approaching the DEC about the deer issue. Council and CCAC members were educated by NYSDEC staff and communicated their positions to the public via some newspaper articles.

Alternatives and Consequences Stages – In the first and second phases of issue evolution, knowledge played an important role at the alternatives and consequences stages. In the first phase, the alternatives/consequences stage was passed through quite quickly. NYSDEC staff relied upon their knowledge of the situation to inform their choice of management action. Little deliberation over alternatives allowed a swift move to the choice stage.

In the second phase, however, the alternatives and consequences stages are seen at a discrete moment in time – the meeting called by the town supervisor. At this meeting, all parties shared their knowledge, educated one another, established common purpose and formed a partnership. NYSDEC's flexibility toward management actions facilitated the collaborative nature of the program.

Choice Stage – In both phases of the Clarence deer issue, knowledge played an important role at the choice stage. In the first phase, NYSDEC staff worked to educate state legislators and inform their decision. In the second phase, the town council used the knowledge it had gained from discussion to make its decision. It communicated its decision to implement a deer management program through the local media, but did not try to ensure that the issue was well-publicized.

Implementation and Evaluation Stages – The implementation stage was reached in the second phase of issue evolution in this case. Partnerships among the town council, NYSDEC, CCAC, hunters, and food bank were important to this stage of issue evolution. These groups worked together to coordinate their efforts. Data regarding the numbers of deer taken are being collected, but there is no formal evaluation of the program in place at this time.

Table D1. Issue evolution stages, dimensions of capacity, and interventions expressed in Clarence, New York.

Issue Evolution Stage	Dimension of Capacity	Element of Intervention
First Phase		
Concern/ Involvement/ Issue	♦ Knowledge ♦ Leadership	♦ Education ♦ Assessment
Alternatives/ Consequences	♦ Knowledge	♦ Education ♦ Agency Flexibility
Choice	♦ Knowledge	♦ Education
Second Phase		
Concern/ Involvement/ Issue	♦ Knowledge ♦ Leadership	♦ Education
Alternatives/ Consequences	♦ Knowledge ♦ Partnerships ♦ Common Purpose	♦ Agency Flexibility ♦ Education
Choice	♦ Knowledge	♦ Education ♦ Informative Communication
Implementation/ Evaluation	♦ Partnerships	♦ Informative Communication

APPENDIX E -- Wilbraham Case Description

The Town of Wilbraham is a suburban community located in south-central Massachusetts. Its land area is 20 square miles and it has a total population of approximately 10,000. Wilbraham is over 85% residential and the median household income is $50,000 per year. The conservation commission designated about 1000 acres of town-owned land as conservation land. For 15 years, the land was an unofficial refuge for deer and other wildlife.

The town is governed by an elected, three-member Board of Selectmen who identify local issues and set the agenda (warrant) for the annual town meeting. Town residents convene for the town meeting to appropriate funds and decide on local issues. All registered voters may attend and speak at this meeting.

Prior to 1985, in accordance with Massachusetts state law, town-owned lands in Wilbraham were open to hunting during the regular season. Private lands were also open to hunting with the landowner's permission. In 1985 a Wilbraham resident was killed in a hunting accident and the town passed a bylaw prohibiting hunting on town-owned land.

Over time, Wilbraham's human and deer populations grew. In October 2000, the Board of Selectmen expressed concern about the local deer and their potential as a public safety risk. Town staff, under the leadership of the secretary to the board of selectmen, collected information on the local deer population. They worked with the police department to collect deer-vehicle accident statistics. After reviewing this information, the selectmen sought recommendations from the Massachusetts Division of Fisheries and Wildlife (DFW). The DFW met with the selectmen and the Wilbraham Conservation Commission (the body responsible for managing most town-owned land) and recommended that town-owned land be opened to controlled, limited, archery hunting.

Town staff drafted a management plan that described the issue, reported statistics, outlined goals and objectives of deer management, and proposed archery as a viable management option. This report was reviewed by the DFW, selectmen, police department, Conservation Commission, and town clerk. Several residents also commented on the report. Throughout this process there was very little opposition to the plan.

At the May 2001 town meeting, selectmen proposed amending the no-hunting bylaw to allow archery hunting on six parcels of town-owned land. There was very little controversy over this issue at the meeting and the article passed by majority vote.

In September 2001, a meeting was held with a Wilbraham police officer, a DFW enforcement officer, and three town staff members. At this meeting, two law-enforcement officers expressed concern about possible protests and safety issues during the archery season. To avoid controversy, the selectmen initiated an information campaign, sending information to Wilbraham landowners whose property abutted the designated town land. Selectmen also prepared information for hunters, directed that hunters attend a mandatory orientation session,

and set a limit of 200 permits to be issued for the designated town land. Information was also publicized through the local newspaper.

Hunters who were interested in applying for permission to hunt on town property had to provide identification and a valid DFW-issued hunting license. Hunters also attended a mandatory hunter orientation meeting where the rules and regulations of the hunt were explained. In 2001, 156 hunters were granted permission to hunt.

In the spring of 2002, town staff compiled statistics on how many deer had been taken from designated town land. They also continued to collect deer-vehicle accident data. After reviewing this information and comparing it to neighboring towns, the selectmen met with the staff to discuss policy changes for the second year of the program. The mandatory hunter orientation meeting was omitted in favor of printed materials and the number of hunters was unchanged (200).

Town staff continues to collect information on deer-vehicle accidents and report a significant decrease since the deer management program was implemented two years ago (66 deer-vehicle accidents in 2000 and 16 deer-vehicle accidents in 2002).

Issue Evolution

The Wilbraham deer issue has evolved through a complete cycle from the "concern" stage to the "evaluation" stage. At the concern and involvement stages, the issue of deer management was identified and gathered momentum. However, because the issue was defined as a problem by town leaders, it was instantly considered a public issue and was not a response to concerns of Wilbraham residents. At the "issue" stage, town staff gathered information on deer-vehicle accidents from police records and sought advice from the DFW. Selectmen, the police department and the Conservation Commission agreed that deer were having enough impact to merit further attention. Town staff considered the DFW's recommendation of implementing an archery season on town land and thought through the feasibility and consequences of this management action. After town residents had voted to amend the no-hunting bylaw and implement an archery season, the building inspector and other town staff administered the hunt. Wilbraham is currently gathering data in an effort to evaluate the efficacy of the deer management program.

Capacity

Concern, Involvement, and Issue Stage – Wilbraham moved quickly through the concern, involvement, and issue stages of evolution because the deer issue was identified by local elected officials. This enabled discussion to take place among those with the authority to act. The selectmen acted as leaders in identifying the deer issue and defining the problem in terms of deer-vehicle accidents. Wilbraham staff increased their knowledge of the local deer issue by assessing the local deer situation, collecting information, and educating themselves. They relied upon their relationships with staff from other town agencies such as the police department and they also formed a partnership with the DFW in learning about deer.

Alternatives/Consequences Stage – In considering what management actions might reduce the public safety risk from deer-vehicle accidents, Wilbraham staff relied upon their partnership with the DFW to increase their knowledge of deer management options. The DFW articulated the range of management options it could endorse (i.e., DFW articulated its range of flexibility) and recommended implementing an archery season, and Wilbraham staff considered the consequences of this management alternative. After deciding that archery was the best management option for the town, Wilbraham staff engaged in public education and outreach to communicate its position to town residents in preparation for the town vote.

Choice Stage – Leading up to the town vote, Wilbraham staff publicized the issues to be decided upon (including the deer issue) in an effort to educate residents. The agenda was communicated to residents through the local newspaper and postings. Wilbraham staff tried to ensure that residents had enough knowledge to make an informed choice.

Implementation Stage – At the implementation stage, Wilbraham residents demonstrated that they had the common goal of reducing deer-vehicle accidents. Town staff took leadership for administering the archery program, and worked together to ensure things ran smoothly. They relied upon relationships they had with local hunters to communicate the goals and regulations of the program. In working together and adhering to the original proposal presented at the town vote, Wilbraham staff increased their credibility.

Evaluation Stage – The evaluation stage is on-going in Wilbraham. In the first two years of the archery program, they have collected information and statistics about harvested deer and deer-vehicle accidents. Wilbraham town staff has acted as leaders and relied upon the partnerships and relationships they have with the hunters and the police department to compile information on harvested deer and deer-vehicle accidents in town. Assessments of past years' results have contributed to any changes in the implementation of the program.

Table E1. Issue evolution stages, dimensions of capacity, and interventions expressed in Wilbraham, Massachusetts.

Issue Evolution Stage	Dimension of Capacity	Element of Intervention
Concern/ Involvement/ Issue	♦ Knowledge ♦ Leadership ♦ Relationships ♦ Partnerships	♦ Education ♦ Assessment
Alternatives/ Consequences	♦ Partnerships ♦ Knowledge	♦ Education ♦ Informative Communication ♦ Agency Flexibility ♦ Assessment
Choice	♦ Knowledge	♦ Education ♦ Informative Communication
Implementation	♦ Common Purpose ♦ Leadership ♦ Partnerships ♦ Relationships ♦ Credibility	♦ Education ♦ Informative Communication
Evaluation	♦ Leadership ♦ Partnerships ♦ Relationships ♦ Knowledge	♦ Education ♦ Assessment

APPENDIX F -- Walpole Case Description

The town of Walpole is a suburban community located near Boston. It has a population of approximately 20,000 residents on 20 square miles. Although most of the community is residential and commercial, there are several hundred acres of protected open space, giving it a rural atmosphere.

The town is governed by an elected Board of Selectmen which identifies public issues and sets the agenda (warrant) for the bi-annual town meetings. Elected representative town residents convene for the town meeting to appropriate funds and decide on local issues. All town residents may attend these meetings, but only those who have been chosen to represent their districts may vote.

At the northern end of Walpole is a large farm parcel. In 1997, this parcel was put up for sale. To avoid the sale of this farm to a developer, the Town of Walpole considered purchasing the land itself. In 1997 the Isaacs' Farm Study Committee was formed to study the pros and cons of purchasing the land. After much consideration, the town bought the farm for just under $7,000,000. Since then, the land has been known as Adams Farm.

Adams Farm is located in a rural section of town that includes both farmland and forest. Two other landowners, the New England Forestry Foundation (NEFF) and the Norfolk County Agricultural High School, own land abutting Adams Farm. In 1998, the three landowners in the area (the Town of Walpole, NEFF, and the Norfolk County Agricultural High School) entered into a memorandum of understanding that articulated their intent to manage the land in as consistent a manner as possible.

At the same time, the Isaacs' Farm Study Committee became the North Walpole Land Use Study Committee. Its members included representatives from each of the landowners as well as some other individuals. The committee received a grant from the Massachusetts Environmental Trust to study the current land use situation and to make recommendations as to how Adams' Farm and abutting lands should be managed. To this end, NEFF contracted a forester and a biologist to conduct forest and wildlife assessments of the land. They found that deer were heavily impacting the regeneration of hardwood saplings, and that to implement an effective forestry program would be futile without first implementing a deer management program.

Meanwhile, deer-vehicle accidents and shrub damage from deer in Walpole were increasing. Selectmen and other Walpole town staff were receiving an increasing number of complaints about deer-related impacts. Realizing that the management of Adams' Farm would be an issue for quite some time, the Selectmen created the Adams Farm Committee, a permanent committee of the town government. Its members are appointed by the Selectmen and hold office for 2 years.

The Adams Farm committee considered several land-use options for the Adams Farm property, including a golf course and playing fields. The Friends of Adams Farm, an interest group, formed to do outreach and fundraising to ensure that Adams Farm is preserved as open

space. In 2002 the Town of Walpole rejected the golf course idea, a victory for the Friends of Adams Farm.

Meanwhile, the issue of deer management on Adams Farm and surrounding areas was still unresolved. In 2001, the Massachusetts Division of Fisheries and Wildlife (DFW) became involved and recommended that the town implement an archery season on the property. The following year, a wildlife biologist from DFW made a presentation to the selectmen and the Walpole Farm committee outlining some basic principles of deer biology and management. In this presentation the DFW biologist made the case that controlled archery is both an effective and safe deer management tool.

Controversy over the deer issue became more apparent in 2002 and local media started reporting on the topic. In early 2003 the Adams Farm committee started gathering support for a proposal to amend the local bylaw banning the discharge of firearms on town land, a necessary first step to implementing archery on Adams Farm. The Town Finance Committee was reluctant to accept such a change because of perceived liability issues. At the May 2003 town meeting, the Finance Committee recommended that the issue be tabled and referred back to the Adams Farm committee for further study. Knowing that most articles need Finance Committee endorsement to pass in Walpole, the Adams Farm committee accepted this recommendation.

On June 9, 2003, the Adams Farm committee met and decided by a tie vote (3 to 3) not to re-submit the bylaw amendment at the fall 2003 town meeting. It is unclear how the issue will develop from here.

Issue Evolution

The Walpole deer issue has evolved from the concern stage to the consequences stage. At the concern and involvement stages, individuals responsible for land management on Adams Farm, the NEFF property, and the Agricultural School became aware of negative impacts from deer on local forest ecology. At the issue stage, these individuals learned that other town residents were also feeling negative impacts from deer, namely deer-vehicle accidents and shrub damage. The nature and degree of impact from deer was great enough to merit political action, and thus the selectmen became involved and appointed the Adams Farm committee. At the alternatives and consequences stages, the Adams Farm committee, the town staff, and the Conservation Commission gathered information about possible deer management options. They first considered implementing a sharp-shooting program, but upon conferring with the DFW biologist decided that the benefits would be maximized by implementing an archery program. To implement this action, a local bylaw banning the discharge of firearms on town land needed to be changed. However, the evolution of the issue stopped just short of the choice stage. Without Finance Committee support, the proposed bylaw amendment had little chance of passing the town vote, and the issue was tabled indefinitely.

Capacity

Concern and Involvement Stages – The concern and involvement stages of the Walpole deer issue were characterized by assessments of forested lands on Adams Farm and surrounding

areas. From these assessments, the Adams Farm committee, the NEFF, and the Agricultural school educated themselves and gained the knowledge they needed to define the deer issue as a problem. The relationships individuals in these organizations had with Walpole residents allowed them to identify other negative impacts from deer, which provided the momentum for the issue to evolve to the next stage.

Issue Stage – At the issue stage of evolution, the three landowner organizations entered into a formal partnership and signed a Memorandum of Understanding, indicating that they shared some common purpose with regard to land management. They also made efforts to educate themselves and increase their knowledge of deer impacts felt by town residents by engaging in dialogue with citizens and gathering information about deer-vehicle accidents from the police department. At this stage, the media began to communicate the details of the issue to the public.

Alternatives and Consequences Stages – In considering what deer management action might alleviate the negative impacts they identified, the Adams Farm committee and others initially considered implementing a sharp-shooting program. The DFW biologist provided an educational program about deer biology and management to the selectmen and Adams Farm committee, and argued that benefits would be maximized by an archery program, not a sharp-shooting program. Partnering with the DFW allowed the Adams Farm committee to increase its knowledge of deer management and to consider the consequences of several management alternatives. The DFW biologist was an effective educator and communicator because he had credibility with the town and was able to demonstrate that the agency was somewhat flexible in what management actions it would accept.

Table F1. Issue evolution stages, dimensions of capacity, and interventions expressed in Walpole, Massachusetts.

Issue Evolution Stage	Dimension of Capacity	Element of Intervention
Concern/ Involvement	♦ Knowledge ♦ Leadership ♦ Relationships	♦ Education ♦ Assessment
Issue	♦ Partnerships ♦ Knowledge ♦ Common Purpose	♦ Education ♦ Informative Communication
Alternatives/ Consequences	♦ Knowledge ♦ Credibility ♦ Partnerships	♦ Education ♦ Informative Communication ♦ Agency Flexibility

APPENDIX G -- Ipswich Case Description

Ipswich, Massachusetts, is located near Boston, on the coast. The town is 30 square miles and has a landscape that includes marshes, dunes and beaches, uplands, forests, fields, and farmland. Ipswich has approximately 10,000 residents and has a very distinct in-town residential and business district and several industrial sections. The town is governed by a five-member elected board of selectmen that identifies public issues and sets the agenda (warrant) for the annual town meeting. Town residents convene for the town meeting to appropriate funds and decide on local issues.

Within the town is a 1400-acre land reservation known as the Crane Memorial Reservation. This parcel was once owned by the Cranes, who built their fortune during the industrial revolution. In 1945, Richard Crane entrusted the property to The Trustees of Reservations (TTOR), who has managed the land since. In 1950, TTOR, the Town of Ipswich, and the Cranes created an Agreement of Adjustment in which TTOR was given the right to propose property regulations and the selectmen were given the right to approve or disapprove them. The first set of regulations created by TTOR and the Selectmen prohibited firearms discharge and hunting on the Crane Memorial Reservation.

In the early 1980s TTOR staff began noticing that the Crane property was being over-browsed by deer, and this was impacting forest regeneration. It was estimated that 300-350 deer lived on the property. At the same time, Ipswich residents began contracting Lyme disease.

In 1982 TTOR decided to address the reforestation and Lyme disease issues by asking the Ipswich selectmen to amend the no-discharge-of-firearms regulation. The proposal failed to gain selectmen support by a vote of 4 to 1.

Confident that negative impacts from deer would continue and worsen, TTOR decided to consult with experts and gather more compelling data. A leading deer biologist was contracted to evaluate deer-range relationships and present management options for the Crane Memorial Reservation. At the same time, the media began publishing information related to the deer issue in Ipswich.

After collecting some additional data the TTOR approached the selectmen again, and the no-firearms-discharge regulation was amended in 1983.

Deer hunting was scheduled to begin the first day of deer season in the fall of 1983, but national and regional animal rights groups threatened to put themselves between the hunters and the deer. Realizing the risk of human injury (accidental shots) and negative publicity was great, TTOR decided to cancel the hunt and work toward achieving more public support before continuing with any lethal deer management program.

Over the next few years, the deer biologist continued his studies of the deer herd on Crane Memorial Reservation and recommended a reduction in the deer population. Other researchers began studies of Lyme ticks and their relationship to deer. A working group of

stakeholders was formed to discuss deer management issues and make recommendations, but no consensus was formed and the group eventually dissipated.

In 1985 a new wildlife biologist was hired at TTOR. He spearheaded an effort to implement a controlled, limited deer hunt on the Crane Memorial Reservation. To this end, the Massachusetts Division of Fisheries and Wildlife (DFW) created a special hunting regulation that allowed shotgun hunting on the property for 90 days and allowed each hunter to take two female deer. Hunters applied to participate in the Crane Memorial Reservation hunt, attended an orientation session, and took a shooting proficiency exam.

Meanwhile, national and regional animal rights groups filed lawsuits to block hunting. The lawsuits were dismissed and hunting on the Crane Memorial Reservation began in the fall of 1985.

Beginning in 1986 studies of the effects of hunting on deer health, vegetation health, and Lyme tick density have been monitored on an annual basis. In 1990 it was estimated that 100 deer were living on the Crane Memorial Reservation, and in 2002 that number dropped to between 40 and 60 deer.

Issue Evolution

The Ipswich deer issue evolved in three phases. In the first phase, the deer issue evolved quickly from the concern stage to the choice stage. In the second phase the deer issue then went back to the issue stage and moved through the choice stage. In the third phase the issue stalled a bit at the alternatives/consequences stage before evolving all the way through to the evaluation stage.

In the first phase of evolution, TTOR staff recognized that deer were negatively impacting vegetation on the Crane Memorial Reservation. Since TTOR was the main entity responsible for and impacted by deer management on the property, therefore they were able to involve Ipswich officials and bring the issue to the choice stage without spending much time considering alternatives and consequences. Because the bylaw change was voted down the first time, TTOR had to gather more information and support for its proposal.

The second phase of issue evolution began in the issue stage as TTOR entered into partnership with researchers and gathered more support for its argument to reduce the deer population. Media attention of Lyme disease and its connection to deer was also increasing at this time, providing additional support for the proposed bylaw change. However, alternative means of implementing a deer population reduction and the consequences of these alternatives were not fully considered during this phase. With more accurate and compelling data, TTOR brought the issue to the selectmen, who voted 4 to 1 to allow hunting on the property.

After the selectmen's vote, evolution of the deer issue stalled. Due to controversy over hunting on the Crane Memorial Reservation, implementation of the hunt was cancelled and alternative means were considered. TTOR entered into partnership with additional researchers and hired an expert wildlife biologist. Gathering information, weighing alternatives, and

communicating with the public were important activities during the alternatives/consequences stage of issue evolution. Implementation of the controlled deer hunt followed, and evaluation of the program has been ongoing since.

Capacity

Concern, Involvement, and Issue Stages – In both the first and second phases of issue evolution, the capacity dimensions of knowledge, leadership, common purpose, and partnerships played important roles. In the first phase, TTOR conducted assessments of deer impacts on vegetation to educate itself and increase its knowledge of the situation. TTOR demonstrated leadership by taking the issue to the Selectmen and requesting a bylaw amendment. In the second phase, knowledge and leadership were important, but so was gathering a sense of common purpose among Ipswich residents and forming credible partnerships with outside experts. In identifying Lyme disease as another important negative impact from deer, TTOR was able to join with Ipswich in its effort to reduce the deer population. Partnering with university researchers provided TTOR with credible, expert information that is used to argue its case to the selectmen.

Alternatives and Consequences Stages – In the first and second phases of issue evolution the alternatives and consequences stages were passed over. Little effort was made to initiate a public deliberation of alternative management actions. In the third phase of issue evolution, education and communication were extremely important. TTOR established partnerships with experts and educated the public. After allowing for sufficient public deliberation on the issue, the choice stage was reached.

Choice Stage – In both the first and second phases of issue evolution, the choice stage was marked by the Selectmen's vote on the no-discharge-of-firearms bylaw. During this stage, TTOR worked to educate the Selectmen about the deer situation on the Crane Memorial Reservation. The Selectmen, in turn, used their increased knowledge to make an informed vote.

Implementation and Evaluation Stage – During the implementation and evaluation stages of issue evolution, TTOR relied upon its partnerships with expert researchers and with hunters to ensure there were no negative consequences of the hunt. TTOR and the media worked in partnership to communicate to the public when and how the hunt would occur, as well as ongoing results of the hunt. TTOR and the town of Ipswich shared the common goal of implementing a safe, effective deer management program.

Table G1. Issue evolution stages, dimensions of capacity, and interventions expressed in Ipswich, Massachusetts.

Issue Evolution Stage	Dimension of Capacity	Element of Intervention
First Phase		
Concern/ Involvement/ Issue	♦ Knowledge ♦ Leadership	♦ Education ♦ Assessment
Alternatives/ Consequences		
Choice	♦ Knowledge	♦ Education
Second Phase		
Issue	♦ Knowledge ♦ Leadership ♦ Common Purpose ♦ Partnerships ♦ Credibility	♦ Education ♦ Informative Communication
Alternatives/ Consequences		
Choice	♦ Knowledge	♦ Education
Third Phase		
Alternatives/ Consequences	♦ Knowledge ♦ Partnerships	♦ Education
Implementation	♦ Partnerships ♦ Common Purpose	♦ Informative Communication
Evaluation	♦ Partnerships	♦ Informative Communication